PROMISE® TECHNOLOGY, INC.

VessRAID

1730s, 1740s, 1830s, 1840s

Product Manual

Version 1.1

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Chapter 1: Introduction to VessRAID

This chapter covers the following topics:

- About This Manual (below)
- VessRAID Overview (page 2)
- Architectural Description (page 3)
- Features and Benefits (page 3)
- Specifications (page 6)

About This Manual

This *Product Manual* describes how to setup, use, and maintain the VessRAID 1700s and 1800s Series external disk array subsystems. It also describes how to use the built-in command-line interface (CLI), command-line utility (CLU) and embedded Web-based Promise Array Management—Professional (WebPAM PROe) software.

This manual includes a full table of contents, index, chapter task lists, and numerous cross-references to help you find the specific information you are looking for.

Also included are four levels of notices:

Note

A *Note* provides helpful information such as hints or alternative ways of doing a task.

Important

An *Important* calls attention to an essential step or point required to complete a task. Important items include things often missed.

Caution

A *Caution* informs you of possible equipment damage or loss of data and how to avoid them.

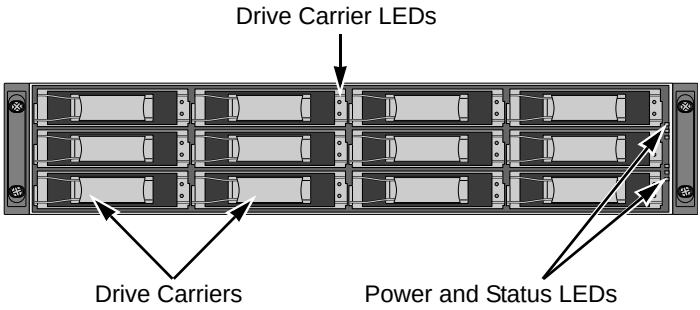
Warning

A *Warning* notifies you of probable equipment damage or loss of data, or the possibility of physical injury, and how to avoid them.

VessRAID Overview

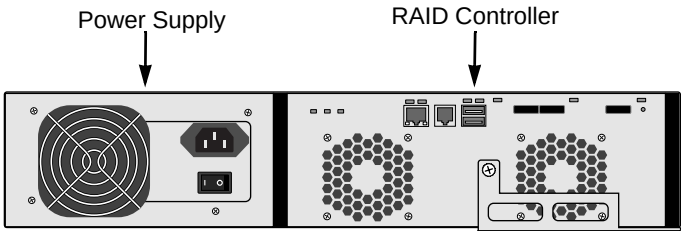
VessRAID provides data storage solutions for applications where high performance and data protection are required. The failure of any single drive will not affect data integrity or accessibility of the data in a RAID protected logical drive.

Figure 1. VessRAID 1730s front view



A defective drive may be replaced without interruption of data availability to the host computer. If so configured, a hot spare drive will automatically replace a failed drive, securing the fault-tolerant integrity of the logical drive. The self-contained hardware-based RAID logical drive provides maximum performance in a compact external chassis.

Figure 2. VessRAID 1730s rear view



Architectural Description

The VessRAID 1700s and 1800s Series are Serial Attached SCSI (SAS) subsystems suitable for Direct Attached Storage (DAS) and Expanded Storage.

The VessRAID subsystems support:

- 3.0 Gb/s SATA disk drives
- 3.0 Gb/s SAS disk drives

All VessRAID enclosures include a mid-plane, RAID controller, power supply unit, and enclosure processor all in one cable-less chassis design. Multiple fans and optional power supplies provide redundancy to ensure continued usage during component failure. The RAID controller is hardware based and controls all logical drive functions transparently to the host system. VessRAID appears to the computer's operating system as a standard SCSI drive or drives.

Features and Benefits

Highlights

- Intel 81348 I/O Processor with 4MB NOR flash memory, 128 MB NAND flash memory for additional functions and 128 KB 8-bit NVRAM.
- 512 MB DDRII SDRAM DIMM expandable to 2GB.
- SDRAM has battery backup up to 72 hours.
- PMC PM8388 expander with 2MB flash memory.
- 10/100Mb RJ45 Ethernet management port.
- RJ11 serial port supports RS232 protocol via adapter cable.
- USB 2.0 external ports for subsystem management.
- 12 hot-swappable drive bays in a robust 2U rackmount chassis.
- 16 hot-swappable drive bays in a robust 3U rackmount chassis.
- Redundant, hot-swappable power supplies on 1800s Series models.
- Supports for SAS and SATA 3 Gb/s drives simultaneously in the same system—choose the drive that is best suited to your application.
- Dual 3 Gb/s SAS x4 host ports provide high-availability SAN and cluster-friendly platform.
- JBOD expansion support through a 3 Gb/s SAS x4 port.
- Simplified remote management with a comprehensive embedded web-based management via Ethernet—WebPAM PROe. Command Line Interface Utility via RJ-11 Serial Port.

- Three years complete system limited warranty includes 24 x 7 email and phone support with highly experienced technical support technicians and an advanced replacements program.
- Support for the latest RAID technology—RAID 6—Protection from a catastrophic double-drive failure.
- Resilient data protection features such as Predictive Data Migration™ and PerfectRAID™ provide rock solid data protection.
- LUN Mapping and Masking bring flexibility for multiple application and OS support on the same storage subsystem.
- Open architecture, industry's most comprehensive support for SAS and SATA hard drives and standards-based management interfaces including SNMP and WBEM.
- Support for the industry standard Disk Data Format (DDF from SNIA) ensures interoperability and drive roaming even among different RAID vendors.
- Compatible with leading SAS hard drives, host bus adapters, and RAID controllers.

Subsystem and Controller Features

- Drive Support: Up to 16 3.5" x 1" SAS or SATA 3 Gb/s hard disk drives.
- Supports any combination of SAS and SATA drives in the system.
- Staggered physical drive spin-up.
- External I/O Ports: Dual 3 Gb/s SAS x4 host ports; One external 3 Gb/s SAS x4 port for JBOD expansion.
- Data Cache: Shared 512 MB predictive data cache (expandable to 2 GB); Automatic write cache destaging; optional 72-hour battery backup (for 512 MB cache).
- Command Queue Depth: 1024 commands per VessRAID.

Operational Features

- RAID Levels: RAID 0, 1, 1E, 5, 6, 10, 50, and 60 – Any combination of these RAID levels can exist at the same time.
- Configurable RAID stripe size: 64 KB, 128 KB, 256 KB, 512 KB, and 1 MB stripe size per logical drive.
- Background task priority tuning: Adjustment of minimum I/O reserved for server use during all background tasks.
- Hot spares: Multiple global or dedicated hot-spare drives with revert option.
- Maximum LUNs per subsystem: 256 in any combination of RAID levels.

- Maximum LUNs per array: 32 logical drives (LUNs). Supports LUN carving by allowing an array to be divided into multiple logical drives. Supports out-of-order logical drive deletion and re-creation.
- LUN Masking and Mapping: Supports multiple hosts.
- Disk Data Formats: Supports Disk Data Format (DDF) for industry-wide standardization and drive roaming between VTrak systems.
- Background Activities: Media Patrol, background synchronizing, disk array rebuild, Redundancy Check, SMART condition pooling, Online Capacity Expansion (OCE), RAID Level Migration (RLM). Includes priority control, rate control, and watermarking per BGA in disk and NVRAM.
- Foreground Activities: Disk array initialization.
- Physical Drive Error Recovery: Predictive Data Migration (PDM), replaces un-healthy disk member in array, while maintaining normal array status during the data transition. Bad Sector Mapping, Media Patrol, SMART, Hard/Soft Reset to recover HD from bad status, HD Power-control to recover HD from hung status.
- Array Error Recovery: Data recovery from bad sector or failed HD for redundant RAID, RAID 5/6 inconsistent data Prevent (Write Hole Table), Data content Error Prevent (Read/Write Check Table) NVRAM event logging.
- SCSI Commands: Supports extensive SCSI command set equivalent to SCSI/FC hard disk drives. Variable sector size (512 byte to 4 KB) to break OS 2TB limitation. 16 byte CDB support for 64-bit LBA addressing.

Management

- Supported Operating Systems: Windows 2003 Server, Windows 2008 Server, Linux (Red Hat, SuSE), Macintosh OS X, Solaris.
- Management Tools: WebPAM PROe via out-of-band Ethernet. OS independent, localized in multiple languages, SSL Security support. Command Line Interface (CLI) and Command Line Utility (CLU) via RJ-11 Serial Port or Telnet.
- Standard Management Protocols: SNMP and WBEM
- RAID Creation: Automatic, Express, and Advanced configuration support for novice to skilled users.
- Management Interfaces: WebPAM PROe, CLU, CLI, audible (buzzer) and visible (LEDs) alarms.
- Management Protocols: Embedded web server and management support—no host agent needed. Ethernet, RJ-11 serial port, SNMP, SSL, Telnet, Email.

Specifications

Power Supply

1840s: 450W, Dual hot-swappable and redundant, 100-240 VAC auto-ranging, 50-60 Hz, with PFC

1830s: 350W, Dual hot-swappable and redundant, 100-240 VAC auto-ranging, 50-60 Hz, with PFC

1740s: 450W, Single, 100-240 VAC auto-ranging, 50-60 Hz, with PFC and 80PLUS certification

1730s: 350W, Single, 100-240 VAC auto-ranging, 50-60 Hz, with PFC and 80PLUS certification

Current (maximum)

1840s: 8 A @ 100 VAC or 4 A @ 240 VAC current rating with two power cords

1830s: 6A @ 100 VAC or 3 A @ 240 VAC Current rating with two power cords

1740s: 7A @ 100 VAC or 3.5 A @ 240 VAC Current rating with one power cord

1730s: 6A @ 100 VAC or 3 A @ 240 VAC Current rating with one power cord

Power Consumption

1740s, 1840s: without disk drives, 41.8 W; with disk drives, 246.7 W

1730s, 1830s: without disk drives, 73.2 W; with disk drives, 231.2 W

Temperature

Normal conditions:

5° to 40°C operational (-40° to 60°C non-operational)

Conditions of running SAS disk drives with one failed cooling fan:

5° to 35°C operational (-40° to 60°C non-operational)

Relative Humidity

95 percent maximum

Vibration

Random, 0.21 grms, 5-500 Hz, 30 Mins, X, Y, Z axis.

Dimensions (H x W x D)

1840s: 13 x 45 x 46 cm (5.1 x 17.7 x 18.1 in)

1830s: 8.8 x 45 x 46 cm (3.5 x 17.7 x 18.1 in)

1740s: 13 x 45 x 46 cm (5.1 x 17.7 x 18.1 in)

1730s: 8.8 x 45 x 46 cm (3.5 x 17.7 x 18.1 in)

Net Weight

1840s: 16.0 kg (35.3 lb) without drives, 24.0 kg (52.9 lb) with 16 drives*

1830s: 13.0 kg (28.7 lb) without drives, 17.0 kg (37.5 lb) with 12 drives*

1740s: 14.0 kg (30.1 lb) without drives, 22.0 kg (48.5 lb) with 16 drives*

1730s: 11.0 kg (25.6 lb) without drives, 17.0 kg (37.5 lb) with 12 drives*

* Assuming 0.5 kg (1.1 lb) per drive.

Carton Dimensions (H x W x D)

All models: 28.5 x 57.2 x 75.2 cm (11.2 x 22.5 x 29.6 in)

Carton Weight

1840s: 20.8 kg (45.9 lb)

1830s: 18.0 kg (39.7 lb)

1740s: 19.2 kg (42.3 lb)

1730s: 16.0 kg (35.3 lb)

Safety

BSMI, CB, CCC, CE, FCC Class B, MIC, VCCI, UL, cUL, TUV.

Environmental

RoHS, China RoHS.

Warranty and Support

Warranty: Three year limited warranty on all components except the battery backup unit, which has a one-year warranty.

Support: 24x7 email and phone support (English only). 24x7 access to Promise support site for drivers, firmware, and compatibility.

CE Statement

Warning: This is a class B product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

KCC Statement

A급 기기 (업무용 정보통신기기)

이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며, 만약 잘못판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

Chapter 2: VessRAID Installation

This chapter covers the following topics:

- Unpacking the VessRAID (below)
- Installing the LCD Panel (Optional) (page 11)
- Mounting VessRAID in a Rack (page 13)
- Installing Disk Drives (page 15)
- Making Data and Management Connections (page 18)
- Setting Up Serial Cable Connections (page 20)
- Connecting the Power (page 21)

Unpacking the VessRAID

The VessRAID box contains the following items:

- VessRAID Unit
- *Quick Start Guide* printed
- RJ11-to-DB9 serial data cable
- Screws for disk drives (70 pieces for 16-bay, 50 pieces for 12-bay)
- 1.5m (4.9 ft) Power cords (1700s models, 1; 1800s models, 2)
- CD with SNMP files, *Product Manual* and *Quick Start Guide* in PDF format

A Battery Backup Unit (BBU) is optional on the VessRAID subsystem. In the event of a power failure, the BBU powers the controller cache to preserve any data it contains.

Caution

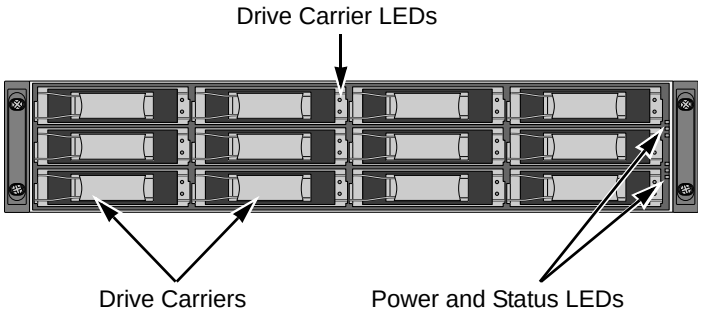
- There is a risk of explosion if the battery is replaced by the incorrect type.
- Dispose of used batteries according to the instructions that accompany the battery.

Warning

The electronic components within the VessRAID enclosure are sensitive to damage from Electro-Static Discharge (ESD). Observe appropriate precautions at all times when handling the VessRAID or its subassemblies.

VessRAID Models and Descriptions						
1800s Model	**Drive Slots**	**Power Supplies**		**1700s Model**	**Drive Slots**	**Power Supplies**
1840s	16	2		1740s	16	1
1830s	12	2		1730s	12	1

Figure 1. VessRAID 1730s and 1830s front view



A defective drive may be replaced without interruption of data availability to the host computer. If so configured, a hot spare drive will automatically replace a failed drive, securing the fault-tolerant integrity of the logical drive. The self-contained hardware-based RAID logical drive provides maximum performance in a compact external chassis.

Figure 2. VessRAID 1840s rear view

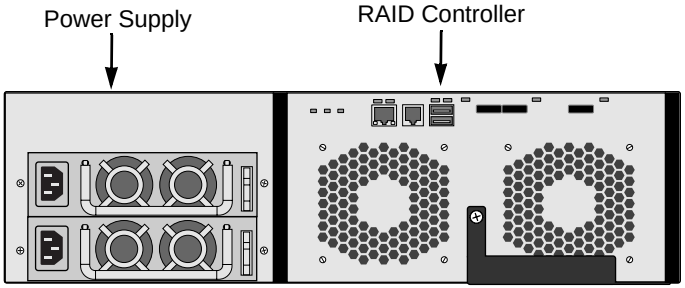
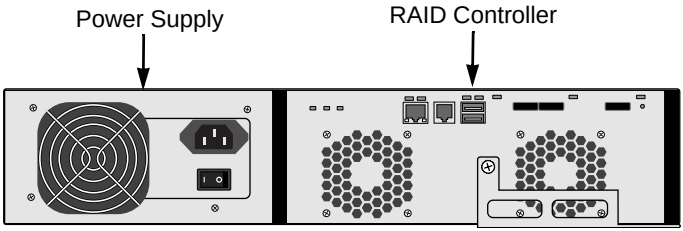


Figure 3. VessRAID 1730s rear view



For a description of the RAID Controller LEDs, see page 22.

Installing the LCD Panel (Optional)

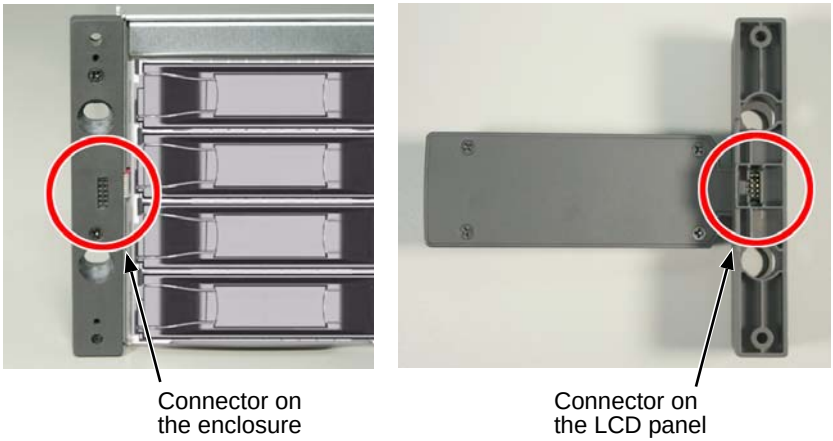
Cautions

- The LCD panel is NOT a hot-swap device. Be sure the VessRAID is powered down before you connect or disconnect the LCD panel.
- You must install the LCD panel before you mount the VessRAID subsystem in a rack.

The LCD panel mounts to the left ear of the VessRAID enclosure.

1. Align the connector on the left bracket of the VessRAID enclosure to the connector on the back of the LCD panel, as shown in Figure 4.

Figure 4. Align the connectors on the enclosure and the LCD panel



2. Insert the two screws that you removed in step 1 through the holes in the left bracket and into the threaded holes in the LCD panel, as shown in Figure 5.

   Tighten the screws to secure the LCD panel to the bracket.

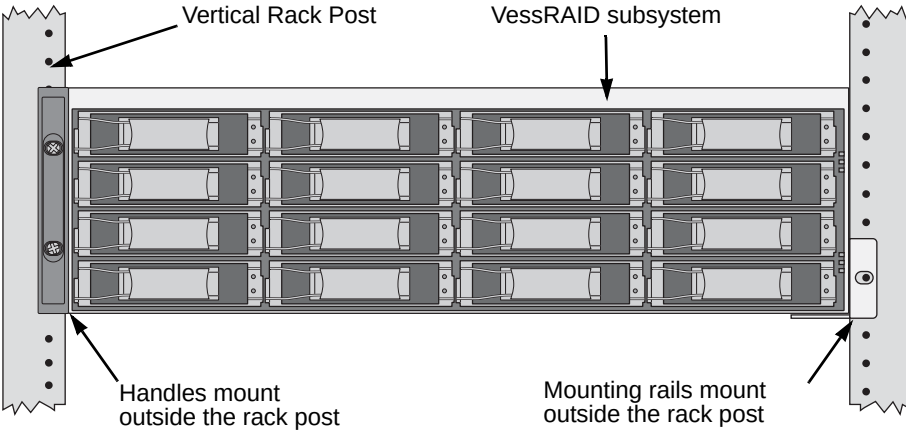
Figure 5. Attach the LCD panel to the VessRAID enclosure

The LCD screen activates when the VessRAID boots. See “Connecting the Power” on page 21.

Mounting VessRAID in a Rack

The VessRAID subsystem installs to the rack using the optional mounting rails. You can also use your existing rails.

Figure 6. VessRAID mounted in a rack with the optional rails



Cautions

- At least two persons are required to safely lift, place, and attach the VessRAID subsystem into a rack system.
- Do not lift or move the VessRAID subsystem by the handles, power supplies or the controller units. Hold the subsystem itself.
- Only a qualified technician who is familiar with the installation procedure should mount and install the VessRAID subsystem.
- Be sure all switches are OFF before installing the VessRAID subsystem or exchanging components.

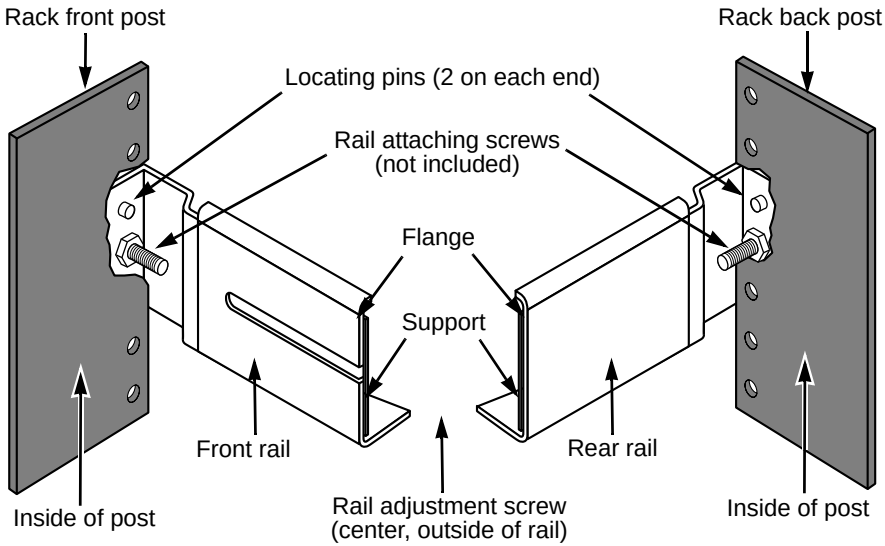
To install the VessRAID subsystem into a rack with the optional mounting rails:

1. Check the fit of the mounting rails in your rack system.
2. Adjust the length of the mounting rails as needed.

3. Attach the mounting rail assemblies to the outside of the rack posts, using the attaching screws from your rack system.

   Be sure the support is on the bottom facing inward.
4. Square the rail assemblies in the rack.
5. Tighten the adjustment screws and the attaching screws.
6. Place the VessRAID subsystem onto the rails.
7. Secure the VessRAID subsystem to the rack through each handle, using the attaching screws from your rack system.

Figure 7. Rack mount assembly diagram



This completes rack mounting.

Installing Disk Drives

You can populate the VessRAID with SAS or SATA hard disk drives. For optimal performance, install physical drives of the same model and capacity. The drives' matched performance allows the logical drive to function better as a single drive. The table below shows the number of drives required for each RAID level.

Level	Number of Drives		Level	Number of Drives
RAID 0	1 or more		RAID 6	4 to 32
RAID 1	2 only		RAID 10	4 or more*
RAID 1E	2 or more		RAID 50	6 or more
RAID 5	3 to 32		RAID 60	8 or more
* Must be an even number of drives.				

Drive Slot Numbering

You can install any suitable disk drive into any slot in the enclosure. The diagram below shows how VessRAID's drive slots are numbered. Slot numbering is reflected in the WebPAM PROe and CLU user interfaces.

Figure 8. VessRAID 1740s and 1840s drive slot numbering

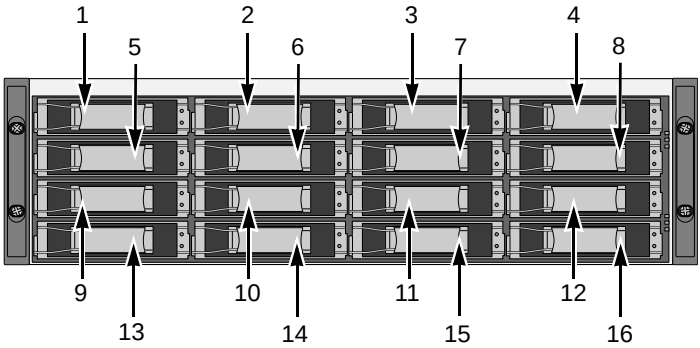
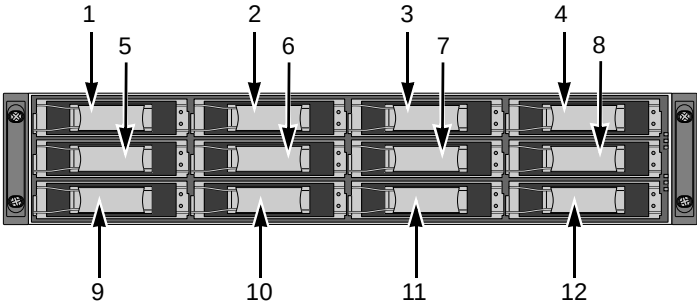


Figure 9. VessRAID 1730s and 1830s drive slot numbering



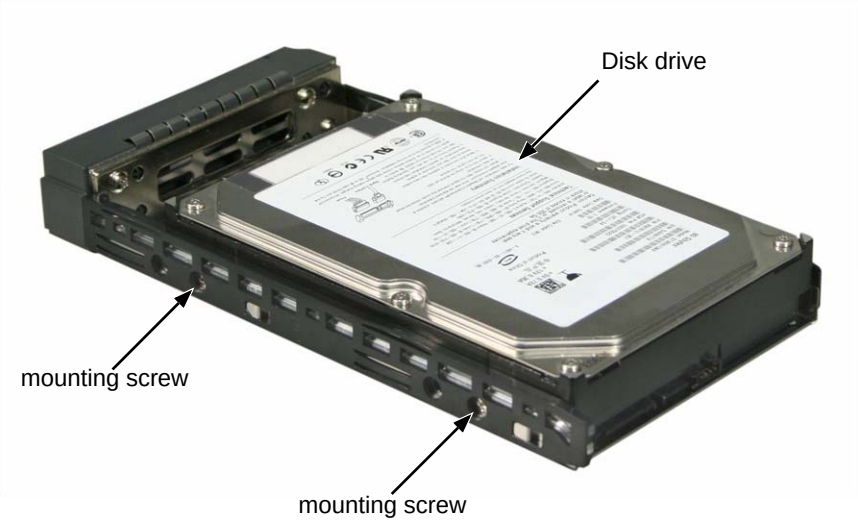
Install all of the drive carriers into the VessRAID enclosure to ensure proper airflow, even if you do not populate all the carriers with disk drives.

Installing Your Disk Drives

1. Remove a disk drive carrier.
2. Carefully lay the disk drive into the drive carrier at the front, so that the screw holes on the sides line up.
3. Insert the screws through the holes in the drive carrier and into the sides of the disk drive.
   - Install only the counter-sink screws supplied with the VessRAID.
   - Install four screws per drive.
   - Snug each screw. Be careful not to over-tighten.
4. Reinstall the drive carrier into the VessRAID chassis.

Repeat steps 1 through 3 until all of your disk drives are installed.

Figure 10. Disk drive mounted in a drive carrier



This completes disk drive installation.

Caution

VessRAID supports disk drive hot-swapping. To avoid hand contact with an electrical hazard, do not remove more than one drive carrier a time.

Making Data and Management Connections

You can configure your VessRAID for:

- Direct Attached Storage (DAS)
- DAS plus JBOD Expansion

Note

VessRAID does not support cascading of multiple RAID subsystems. Cascading is planned for a future release.

Configuring a Data Path

To establish the data path:

1. Connect the SAS HBA card in the Host PC to the SAS IN ports (with a circle icon) on the VessRAID controller. See Figure 11.
2. Connect the SAS Expansion port (with a diamond icon) of the VessRAID controller to the SAS IN port (with a circle icon) on the I/O module of the first VessJBOD.
3. Connect the SAS OUT port (with a diamond icon) of the VessJBOD I/O module of the first VessJBOD to the SAS IN port (with a circle icon) on the I/O module of the second VessJBOD.
4. Connect the remaining VessJBOD units in the same manner.

   Be sure to connect circle icon to diamond icon and vice versa.

   All SAS ports have SFF-8088 connectors.

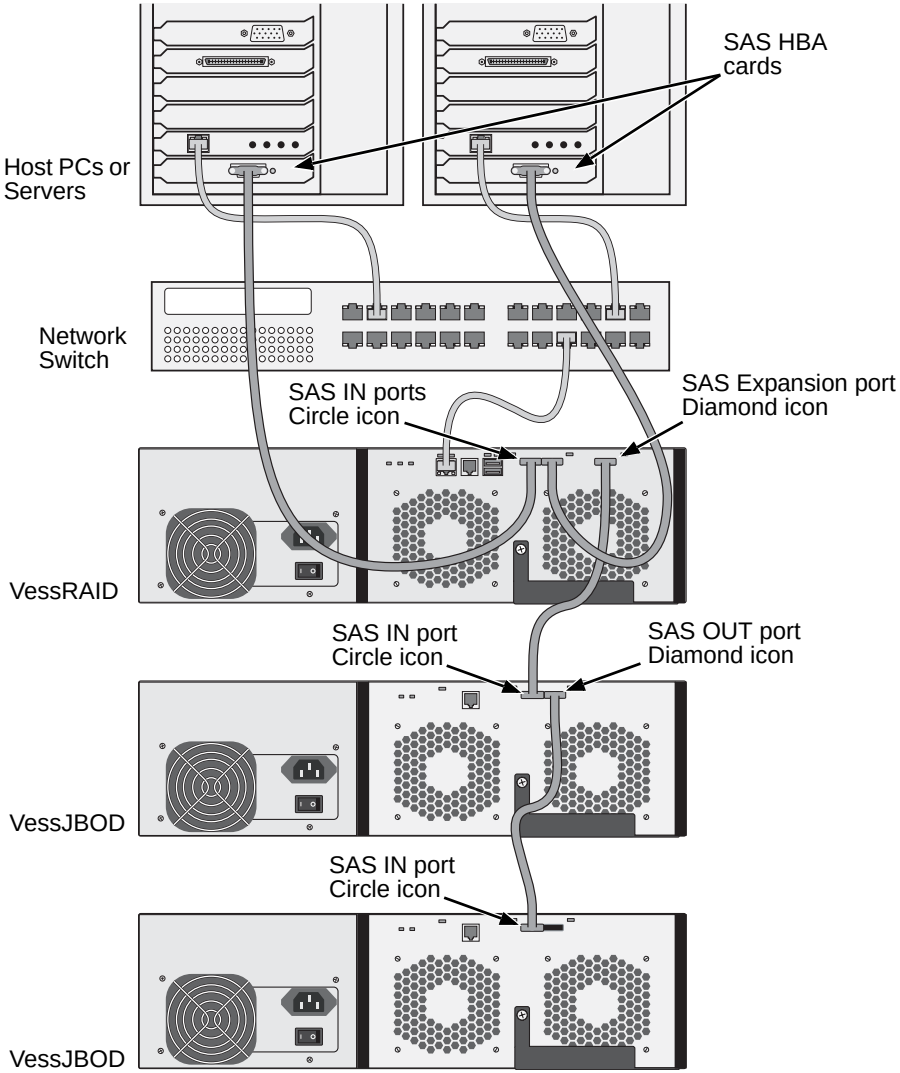
Configuring a Management Path

VessRAID subsystems have one RAID controller. The controller has an Ethernet (RJ45) Management Port connector that enables you to monitor the VessRAID over your network using the WebPAM PROe software. VessRAID supports HTTP, HTTPS, and Telnet protocols.

To establish the management path:

1. Connect the Management port on each Controller to your network switch. See Figure 11.
2. Connect the Host PC's or Server's NIC to your network switch.

Figure 11. Data and management connections



Caution

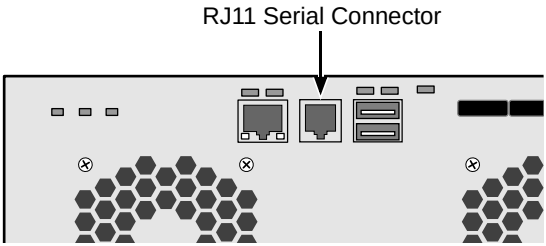
Make data connections carefully. If you accidently switch a SAS IN connection with a SAS OUT, the RAID system cannot function.

This completes data and management connections.

Setting Up Serial Cable Connections

Serial communication enables the Command Line Interface (CLI) and Command Line Utility (CLU) on your PC to monitor and control the VessRAID. The VessRAID package includes a RJ11-to-DB9 serial data cable.

Figure 12. A serial connector is located on the controller



To set up a serial cable connection:

1. Attach the RJ11 end of the serial data cable to the RJ11 serial connector on the controller.
2. Attach the DB9 end of the serial data cable to a serial port on the Host PC or Server.

This completes the serial cable connection. See “Setting up the Serial Connection” on page 25.

Connecting the Power

Plug-in the power cord on the power supply on the back of the VessRAID enclosure and switch on the power supply. If you have a redundant power supply, plug-in both power supplies and turn on both power supplies.

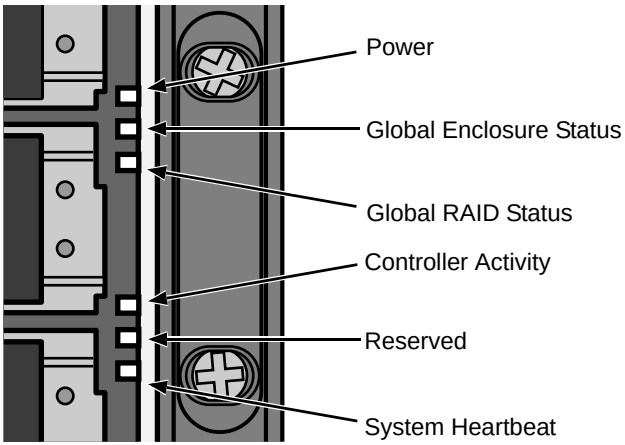
When the power is switched on, the LEDs and LCD screen light up.

Front Panel LEDs

When boot-up is finished and the VessRAID subsystem is functioning normally:

- Power, Global Enclosure Status, and Global RAID Status LEDs display green continuously.
- Controller Activity LED flashes green when there is controller activity.
- System Heartbeat LED blinks green seven times in three seconds, goes dark for six seconds, then repeats the pattern.

Figure 13. VessRAID front panel LEDs

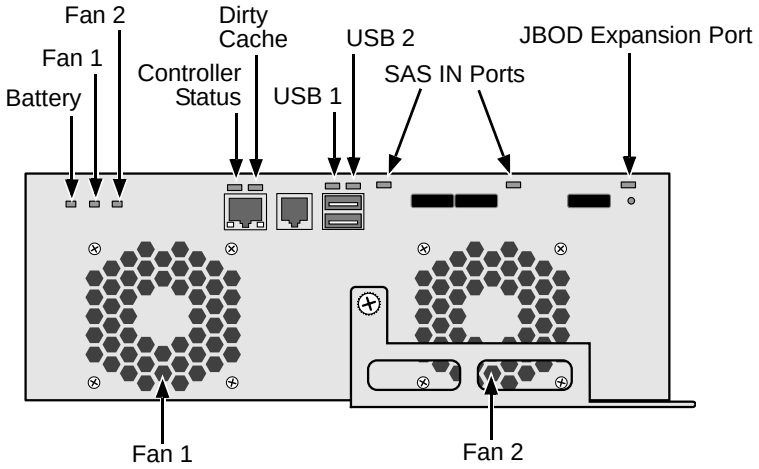


Controller LEDs

When boot-up is finished and the VessRAID subsystem is functioning normally:

- Battery, and Controller status LEDs display green continuously.
- Management port activity LEDs display green or flash depending on your network connection.

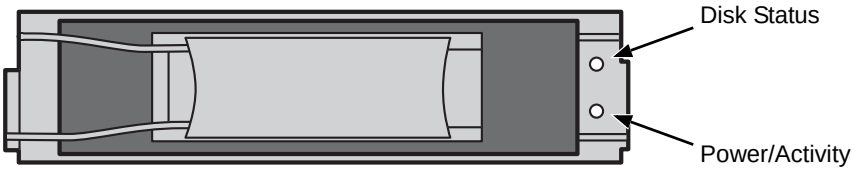
Figure 14. VessRAID Controller LEDs



Disk Drive LEDs

There are two LEDs on each Drive Carrier. They report the presence of a disk drive, activity of the drive, and the drive's current condition.

Figure 15. VessRAID disk drive carrier LEDs



If there is a disk drive in the carrier, the Power/Activity LED displays Green. If not, the Power/Activity LED remains dark. The Power/Activity LED flashes during drive activity.

The Disk Status LED displays Green when a drive is configured.

LCD Panel

The LCD panel activates approximately 35 seconds after you switch on the VessRAID's power supply.

At first, the LCD screen displays `System is Initializing`.

When the VessRAID is fully booted and running under normal conditions, the LCD screen shows the VessRAID model number and IP address, as shown in Figure 16.

Figure 16. VessRAID optional LCD display

A list of LCD panel functions and instructions for using them is included in the *VessRAID Product Manual* on the CD.

This completes the power and start-up.

For setup instructions, see "Chapter 3: VessRAID Setup" on page 25.

Chapter 3: VessRAID Setup

This chapter covers the following topics:

- Setting up the Serial Connection (below)
- Choosing DHCP or a Static IP Address (page 26)
- Setting up with the CLI (page 27)
- Setting up with the CLU (page 28)
- Setting up with the LCD (page 30)
- Creating Disk Arrays with WebPAM PROe (page 32)

Setting up the Serial Connection

VessRAID has a Command Line Interface (CLI) to manage all of its functions, including customization. A subset of the CLI is the Command Line Utility (CLU), a user-level interface that manages your VessRAID via your PC's terminal emulation program, such as Microsoft HyperTerminal. This procedure uses the serial cable connection you made in Chapter 2, page 20.

You must use the CLI or CLU to assign an IP address to the VessRAID to enable a network connection for WebPAM PROe.

1. Change your terminal emulation program settings to match the following specifications:
   - Bits per second: 115200
   - Data bits: 8
   - Parity: None
   - Stop bits: 1
   - Flow control: none
2. Start your PC's terminal VT100 or ANSI emulation program.
3. Press Enter once to launch the CLI.
4. At the Login prompt, type **administrator** and press Enter.
5. At the Password prompt, type **password** and press Enter.

   At this point, you are in the CLI. You can continue using the CLI to make network settings or you can switch to the CLU. Go to:
   - Setting up with the CLI (page 26)
   - Setting up with the CLU (page 27)

Choosing DHCP or a Static IP Address

When you setup your VessRAID, you have the option of:

- Enabling DHCP and letting your DHCP server assign the IP address to the VessRAID's management port.
- Specifying a static IP address for the VessRAID's management port.

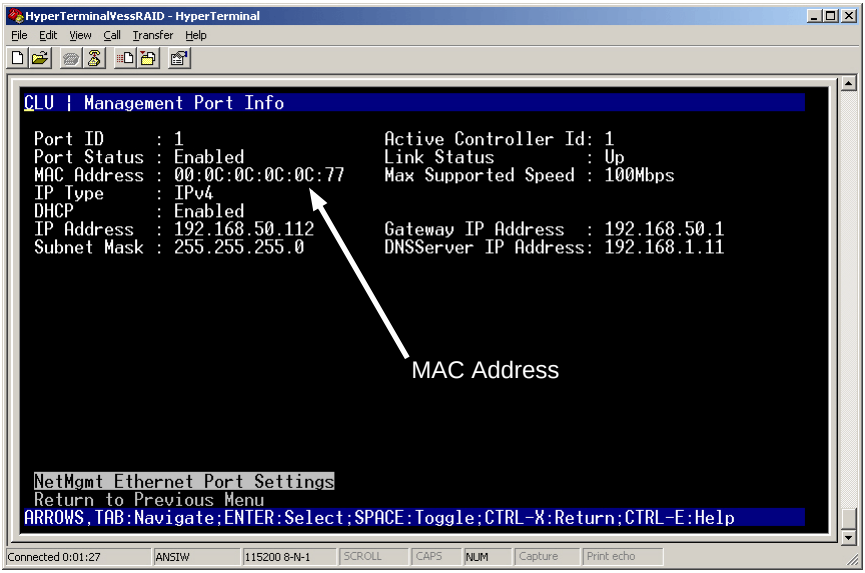
If you choose to enable DHCP, have your Network Administrator dedicate an IP address for the VessRAID, linked to the VessRAID's MAC address. This action will prevent the DHCP server from assigning a new IP address when the VessRAID restarts, with the result that users can no longer log in.

To access the MAC address for VessRAID's management port:

1. At the administrator@cli> prompt, type **menu** and press Enter.

   The CLU main menu appears.

2. In the CLU Main Menu, highlight *Network Management* and press Enter, then highlight the management port and press Enter.



Default IP Address

VessRAID ships from the factory a default Management Port IP address of 192.168.0.1. You must change this address to work with your network.

Setting up with the CLI

1. Type the following string to set the system date and time, then press Enter.

   administrator@cli> **date -a mod -d 2009/01/25 -t 14:50:05**

   In the above example, the date and time are included as examples only. Your values will be different. Use yyyyy/mm/dd for the date and a 24-hour clock for the time.

2. Type the following string to set the Management Port IP address and other settings, then press Enter.

   administrator@cli> **net -a mod -t mgmt -s "primaryip=192.168.10.85, primaryipmask=255.255.255.0, gateway=192.168.10.1"**

   In the above example, the IP addresses and subnet mask are included as examples only. Your values will be different.

   If you prefer to let your DHCP server assign the IP address, type the following string, then press Enter.

   administrator@cli> **net -a mod -t mgmt -s "dhcp=enable"**

3. To verify the settings, type **net** and press Enter.

   administrator@cli> **net**

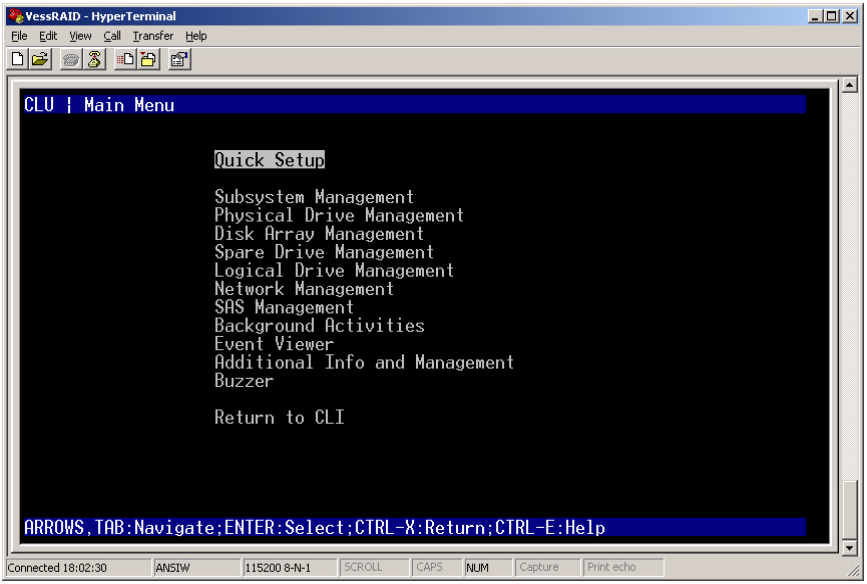
   ```
   ==========================================
   CId Port Type   IP             Mask          Gateway       Link
   ==========================================
   1   1    Mgmt   192.168.10.85  255.255.255.0 192.168.10.1  Up
   ```

This completes the Management port setup.

Setting up with the CLU

1. At the administrator@cli> prompt, type **menu** and press Enter.
   The CLU main menu appears.

Figure 1. CLU main menu



2. With *Quick Setup* highlighted, press Enter.
   The first Quick Setup screen enables you to make Date and Time settings.

Setting system date and time

1. Press the arrow keys to highlight *System Date*.
2. Press the backspace key to erase the current date.
3. Type the new date.
4. Follow the same procedure to set the System Time.
5. Press Ctrl-A to save these settings and move to the Management Port configuration screen.

Making Manual IP Settings

To make Management Port settings manually:

1. Press the arrow keys to highlight *IP Address*.
2. Press the backspace key to erase the current IP Address.

3. Type the new IP Address.
4. Follow the same procedure to specify the Subnet Mask, Gateway IP Address and DNS Server IP Address.

   If you do not have a DNS server, skip the DNS Server IP address.
5. Press Ctrl-A to save your settings.

Making Automatic IP Settings

To make Management Port settings automatically:

1. Press the arrow keys to highlight *DHCP*.
2. Press the spacebar to toggle to *Enable.*
3. Press Ctrl-A to save these settings.

Viewing IP Address and Settings

To view the current IP address and network settings when using DHCP:

1. Press the arrow keys to highlight *DHCP*.
2. Press the spacebar to toggle to *Disable*.

   The current Management Port settings are displayed.
3. Press the spacebar to toggle DHCP back to *Enable*.
4. Press Ctrl-A to save these settings and move to the RAID configuration screen.

Exiting the CLU

1. Highlight *Skip the Step and Finish* and press Enter.
2. Highlight *Return to CLI* and press Enter.

This completes the Management Port setup.

Setting up with the LCD

The LCD Panel displays the current IP address during normal operation. If you did not install the LCD Panel, see “Installing the LCD Panel (Optional)” on page 11. The LCD does not have a date and time function.

Figure 2. LCD Panel default view

Making Manual IP Settings

To make Management Port settings manually:

1. Press the ▲ or ▼ button until the display says *Management Port*.
2. Press the ↵ button and the display says *Link Status Up*.

   If it says *Link Status Down*, reconnect to the network before preceding.
3. Press the ▲ or ▼ button and the display says *IP Address.*
4. Press the ↵ button to make a change.

   The current IP Address displays with the cursor under the first (extreme left) digit.
5. Press the ▲ button to increment and the ▼ button decrement.

   Press the ESC button to move left and the ↵ button move right.

   To set an IP address with double- or single-digit octets, for example, 192.168.1.50, type zeros as placeholders, **192.168.001.050**.

   After you have set the last (extreme right) digit, press the ↵ button.

   The current Subnet Mask displays with the cursor under the first (extreme left) digit.
6. Make the needed changes the same as in step 5.

   After you have set the last (extreme right) digit, press the ↵ button.

   The current Gateway displays with the cursor under the first (extreme left) digit.

7. Make the needed changes the same as in step 5.

   After you have set the last (extreme right) digit, press the ↵ button.
   The display says *Save Network Setting?*

8. Press the ↵ button to confirm.
   The display shows the new IP address you set.

Making Automatic IP Settings

To make Management Port settings automatically:

1. Press the ▲ or ▼ button until the display says *Management Port*.
2. Press the ↵ button and the display says *Link Status Up*.
   If it says *Link Status Down*, reconnect to the network before preceding.
3. Press the ▲ or ▼ button and the display says *DHCP Disable.*
4. Press the ↵ button to make a change.
5. Press the ↵ button to Enable.
6. Press the ↵ button to confirm.
   The display shows the new IP address set by the DHCP server.

This completes the Management Port setup.

Creating Disk Arrays with WebPAM PROe

Note

You can also use the CLU or the LCD panel to create disk arrays and logical drives. See page 148 or page 206 for more information.

Setting up disk arrays with WebPAM PROe consists of the following actions:

- Logging into WebPAM PROe (below)
- Choosing a Language (page 34)
- Creating a Disk Array (page 34)
- Logging out of WebPAM PROe (page 38)

Logging into WebPAM PROe

1. Launch your Browser.
2. In the Browser address field, type the IP address of the VessRAID subsystem. See “Setting up the Serial Connection” on page 25.

   Note that the IP address shown below is only an example. The IP address you type into your browser will be different.

Regular Connection

- WebPAM PROe uses an HTTP connection. . . . . .http://
- Enter the VessRAID’s IP address 192.168.10.85

Together, your entry looks like this:

http://192.168.10.85

Secure Connection

- WebPAM PROe uses a secure HTTP connection. . . . . .https://
- Enter the VessRAID’s IP address 192.168.10.85

Together, your entry looks like this:

https://192.168.10.85

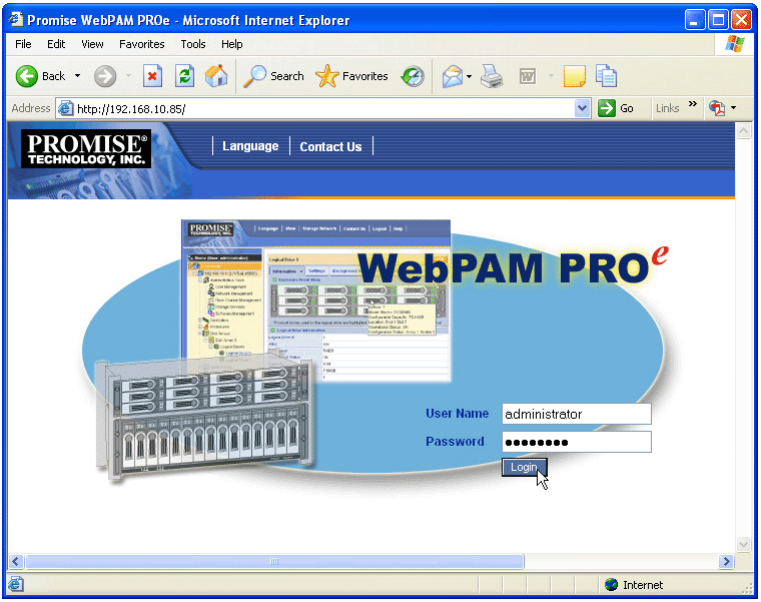
Note

Whether you select a regular or a secure connection, your login to WebPAM PROe and your user password are always secure.

3. When the log-in screen (Figure 2) appears:
   - Type **administrator** in the User Name field.
   - Type **password** in the Password field.
   - Click the **Login** button.

   The User Name and Password are case sensitive.

Figure 3. WebPAM PROe log-in screen



After sign-in, the WebPAM PROe opening screen appears. If there are any unconfigured physical drives in the enclosure, an Array Configuration menu will also appear (see page 35).

Note

Make a Bookmark (Netscape Navigator) or set a Favorite (Internet Explorer) of the Login Screen so you can access it easily next time.

Choosing a Language

WebPAM PROe displays in English, German, French, Italian, Spanish, Russian, Japanese, Chinese Traditional, Chinese Simple, and Korean.

1. Click **Language** on the WebPAM PROe banner.

   The language list appears in the Header.

2. Click the language you prefer.

   The WebPAM PROe user interface displays in the selected language.

Figure 4. Clicking "Language" on the WebPAM PROe banner

Creating a Disk Array

On a newly activated VessRAID subsystem, there are no disk arrays or logical drives. To create a disk array:

1. Click on the Disk Arrays icon, then click on the Create tab.

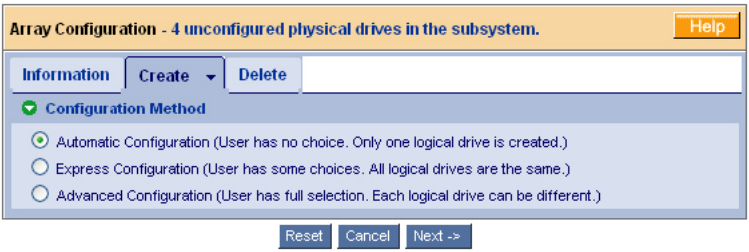
   The Array Configuration menu appears. See Figure 19.

2. Choose one of the options:

   - **Automatic** – Creates a new disk array following a default set of parameters. Makes one logical drive automatically. Also makes a hot spare drive for all RAID levels except RAID 0, if at least five unconfigured physical drives are available. If you have multiple enclosures, multiple disk array and logical drive sets are created. See page 35.
   - **Express** – You choose the parameters for a new disk array by specifying the characteristics you want. You can create multiple logical drives at the same time, however they will all be identical. You can choose to make a hot spare drive for all RAID levels except RAID 0, if at least five unconfigured physical drives are available. See page 36.
   - **Advanced** – You directly specify all parameters for a new disk array. Makes one logical drive automatically. You can create additional logical drives at a later time, if additional configurable capacity is available. Does not make a hot spare drive. See page 37.

3. Click the **Next** button.

Figure 5. The Array Configuration menu


Array Configuration - 4 unconfigured physical drives in the subsystem.
Help
Information
Create
Delete
Configuration Method
Automatic Configuration (User has no choice. Only one logical drive is created.)
Express Configuration (User has some choices. All logical drives are the same.)
Advanced Configuration (User has full selection. Each logical drive can be different.)
Reset
Cancel
Next ->

Automatic

When you choose the Automatic option, the following parameters appear on the screen:

- **Disk Arrays** – The number of physical drives in the disk array, their ID numbers, configurable capacity, and the number of logical drives to be created
- **Logical Drives** – The ID number of the logical drives, their RAID level, capacity, and stripe size
- **Spare Drives** – The physical drive ID number of the dedicated hot spare assigned to this disk array

If you have both Hard Disk Drives (HDD) and Solid State Drives (SSD), separate disk array and logical drive sets will be created for your HDDs and for your SSDs. These two drive types cannot be mixed in the same disk array.

If you accept these parameters, click the **Submit** button. The new disk array appears in the Disk Array List on the Information tab.

If you do NOT accept these parameters, use the Express (page 36) or Advanced (page 37) option to create your disk array.

Express

When you choose the Express option, a set of characteristics and options appears on the screen.

1. Check the boxes to select any one or a combination of:
   - **Redundancy** – The array will remain available if a physical drive fails
   - **Capacity** – The greatest possible amount of data capacity
   - **Performance** – The highest possible read/write speed
   - **Spare Drive** – A hot spare drive
2. In the Number of Logical Drives field, enter the number of logical drives you want to make from this disk array.

   The maximum possible number of logical drives appears to the right of this field.
3. From the Application Type menu, select an application that best describes your intended use for this disk array:
   - File Server
   - Video Stream
   - Transaction Data
   - Transaction Log
   - Other
4. Click the **Update** button.

   Or check the Automatic Update box and updates will occur automatically.

   The following parameters display:
   - **Disk Arrays** – The number of physical drives in the disk array, their ID numbers, configurable capacity, and the number of logical drives to be created
   - **Logical Drives** – The ID number of the logical drives, their RAID level, capacity, and stripe size
   - **Spare Drives** – The physical drive ID number of the dedicated hot spare assigned to this disk array

   If you have both Hard Disk Drives (HDD) and Solid State Drives (SSD), separate disk arrays will be created for your HDDs and for your SSDs. Each array will have the number of logical drives that you specified.

   If you accept these parameters, proceed to the next step. If NOT, review and modify your selections in the previous steps.
5. When you are done, click the **Submit** button.

   The new disk array appears in the Disk Array List on the Information tab.

Advanced

Note

For an explanation of the parameters under the Advanced option, see “Chapter 8: Technology Background” on page 233.

Step 1 – Disk Array Creation

1. Enter a name for the disk array in the field provided.
2. Check the boxes to enable the following features.
   - **Media Patrol** – A routine maintenance procedure that checks the magnetic media on each disk drive. Media Patrol is concerned with the condition of the media itself, not the data recorded on the media.
   - **PDM** – Predictive Data Migration (PDM) scans the bad sector remapping table of the disk drives assigned to a logical drive. When the table fills to a specified percentage of its capacity, PDM triggers a migration of data from the suspect drive (the disk drive with the bad sectors) to a spare disk drive.
3. From the Media Type dropdown menu, choose the physical drive type to use in the array.
   - **HDD** – Hard Disk Drives
   - **SSD** – Solid State Drives

   The drive type you selected appears in the list of Physical Drives. You cannot mix HDDs and SSDs in the same disk array.
4. Highlight the physical drives you want in the disk array from the Available list and press the **>>** button to move them to the Selected list.

   You can also double-click them to move them.
5. When you are done, click the **Next** button.

Step 2 – Logical Drive Creation

1. Optional. Enter an Alias (name) for the first logical drive.
2. Choose a RAID level for the logical drive from the dropdown menu.

   The choice of RAID levels depends on the number of physical drives you selected.
3. RAID 50 and 60. Choose the number of axles from the dropdown menu.
4. Specify a Capacity and the unit of measure (MB, GB, or TB).

   This value will be the data capacity of the logical drive. If you specify less than disk array’s maximum capacity, the remainder is available for additional logical drives.

5. Specify a Stripe size from the dropdown menu.

   64, 128, 256, 512 KB, and 1 MB are available. 64 KB is the default.

6. Specify a Sector size from the dropdown menu.

   512 Bytes, 1, 2, and 4 KB are available. 512 Bytes is the default.

7. Choose a Read Cache policy:

   Read Cache, *Read Ahead Cache*, and *No Cache* are available. Read Ahead is the default.

8. Choose a Write Cache policy:

   Write Back and *Write Through* are available. Write Back is the default.

9. From the Initialization dropdown menu, choose an Initialization policy.

   None, *Quick*, and *Full* are available. None is the default but is not recommended.

10. Click the **Update** button.

    A new logical drive is displayed under New Logical Drives.

    Repeat the above steps to specify additional logical drives as desired.

11. When you have finished specifying logical drives, click the **Next** button.

Step 3 – Summary

The Summary lists the disk array and logical drive information you specified.

To proceed with disk array and logical drive creation, click the **Submit** button.

Note

This function does not automatically create a hot spare drive. After you create the disk array, you should create a hot spare drive. See “Chapter 4: Management with WebPAM PROe” on page 41.

Logging out of WebPAM PROe

There are two ways to log out of WebPAM PROe:

- Close your browser window
- Click **Logout** on the WebPAM PROe banner

Figure 6. Clicking “Logout” on the WebPAM PROe banner

Clicking **Logout** brings you back to the Login Screen. See page 30.

After logging out, you must enter your user name and password in order to log in again.

Using WebPAM PROe over the Internet

The above instructions cover connections between VessRAID and your company network. It is also possible to connect to a VessRAID from the Internet.

Your MIS Administrator can tell you how to access your network from outside the firewall. Once you are logged onto the network, you can access the VessRAID using its IP address.

While only a Fibre Channel or SAS-capable PC can read and write data to the logical drives on the VessRAID, other PCs can monitor the VessRAID from virtually any location.

Chapter 4: Management with WebPAM PROe

This chapter covers the following topics:

- Logging into WebPAM PROe (page 42)
- Perusing the Interface (page 44)
- Working with the Storage Network (page 49)
- Working with Subsystems (page 50)
- Managing Users (page 60)
- Managing the Network Connection (page 65)
- Managing SAS Connections (page 66)
- Managing Storage Services (page 68)
- Managing Software Services (page 71)
- Exporting the User Database (page 78)
- Importing a User Database (page 78)
- Importing a Configuration Script (page 79)
- Updating the Firmware (page 80)
- Viewing Flash Image Information (page 80)
- Restoring Factory Defaults (page 81)
- Clearing Statistics (page 81)
- Shutting Down the Subsystem (page 82)
- Starting Up After Shutdown (page 84)
- Restarting the Subsystem (page 85)
- Managing the Controller (page 86)
- Managing Enclosures (page 90)
- Managing Physical Drives (page 96)
- Managing UPS Units (page 102)
- Managing Disk Arrays (page 105)
- Managing Logical Drives (page 118)
- Managing Spare Drives (page 124)
- Working with the Logical Drive Summary (page 128)

For information about VessRAID's audible alarm and LEDs, see "Chapter 9: Troubleshooting" on page 265.

Logging into WebPAM PROe

1. Launch your Browser.
2. In the Browser address field, type the IP address of the VessRAID subsystem.

   See “Setting up the Serial Connection” on page 25. Note that the IP address shown below is only an example. The IP address you type into your browser will be different.

Regular Connection

- WebPAM PROe uses an HTTP connection. . . . . .http://
- Enter the VessRAID’s IP address 192.168.10.85

Together, your entry looks like this:

http://192.168.10.85

Secure Connection

- WebPAM PROe uses a secure HTTP connection. . . . . .https://
- Enter the VessRAID’s IP address 192.168.10.85

Together, your entry looks like this:

https://192.168.10.85

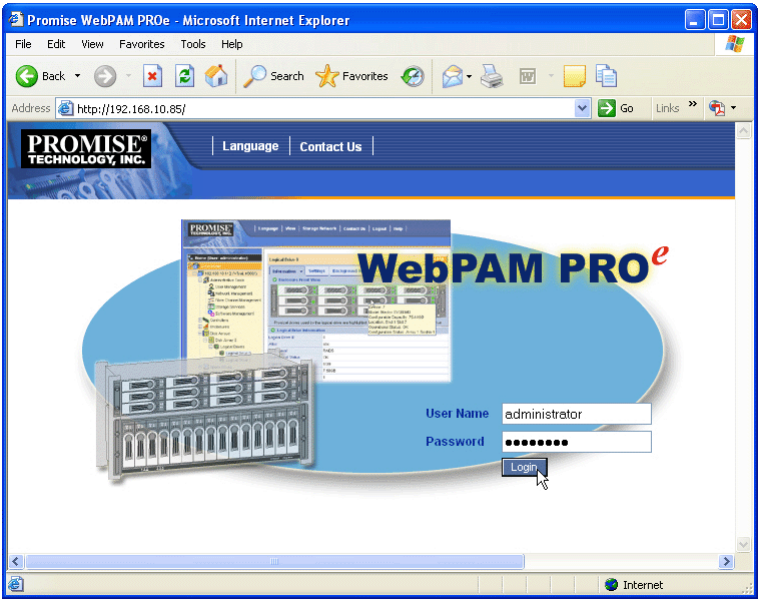
Note

Whether you select a regular or a secure connection, your login to WebPAM PROe and your user password are always secure.

3. When the log-in screen (Figure 1.) appears:
   - Type **administrator** in the User Name field.
   - Type **password** in the Password field.
   - Click the **Login** button.

   The User Name and Password are case sensitive.

Figure 1. WebPAM PROe log-in screen



After sign-in, the WebPAM PROe opening screen appears. If there are any unconfigured physical drives in the enclosure, an Array Configuration menu will also appear (see page 31).

Note

Make a Bookmark (Netscape Navigator) or set a Favorite (Internet Explorer) of the Login Screen so you can access it easily next time.

Selecting a Language

WebPAM PROe displays in English, German, French, Italian, Spanish, Russian, Japanese, Chinese Traditional, Chinese Simple, and Korean.

1. Click **Language** on the WebPAM PROe banner.

   The language list appears in the Header.

2. Click on the language you prefer.

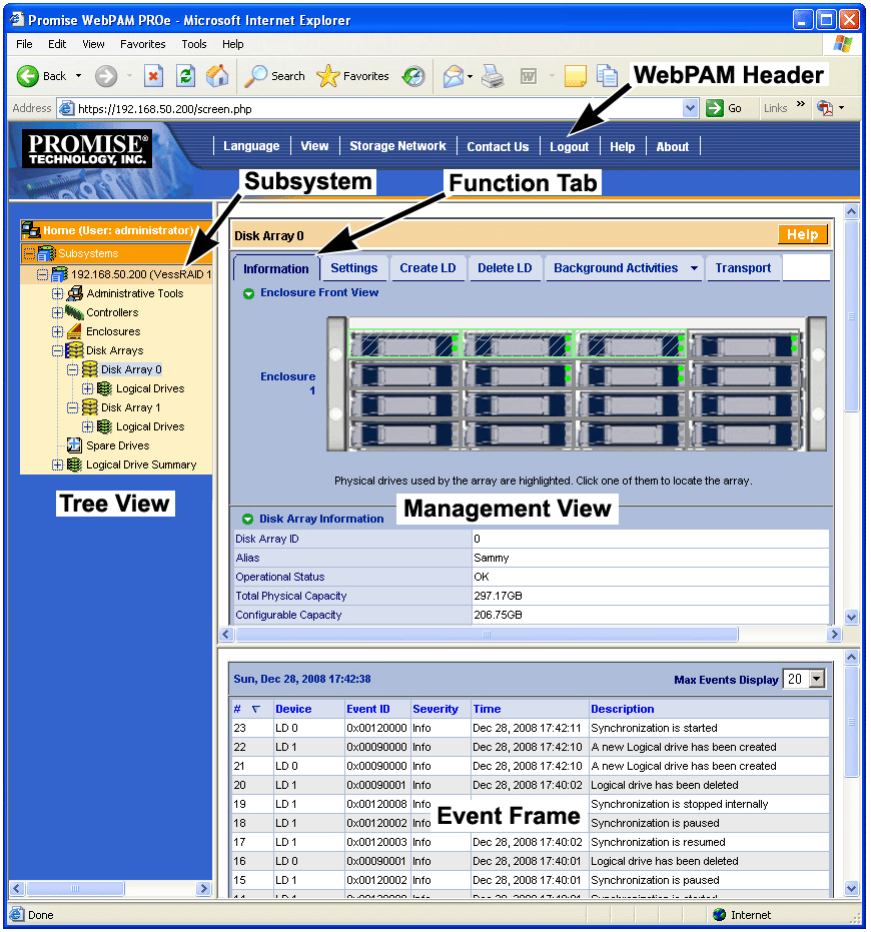
   The WebPAM PROe user interface displays in the selected language.

Figure 2. Clicking "Language" on the WebPAM PROe banner

Perusing the Interface

WebPAM PROe is browser-based RAID management software with a graphic user interface.

Figure 3. WebPAM PROe interface



There are four major parts to the graphic user interface:

- Header (see below)
- Tree (see page 46)
- Management View (see page 47)
- Event Frame (see page 47)

Using the Header

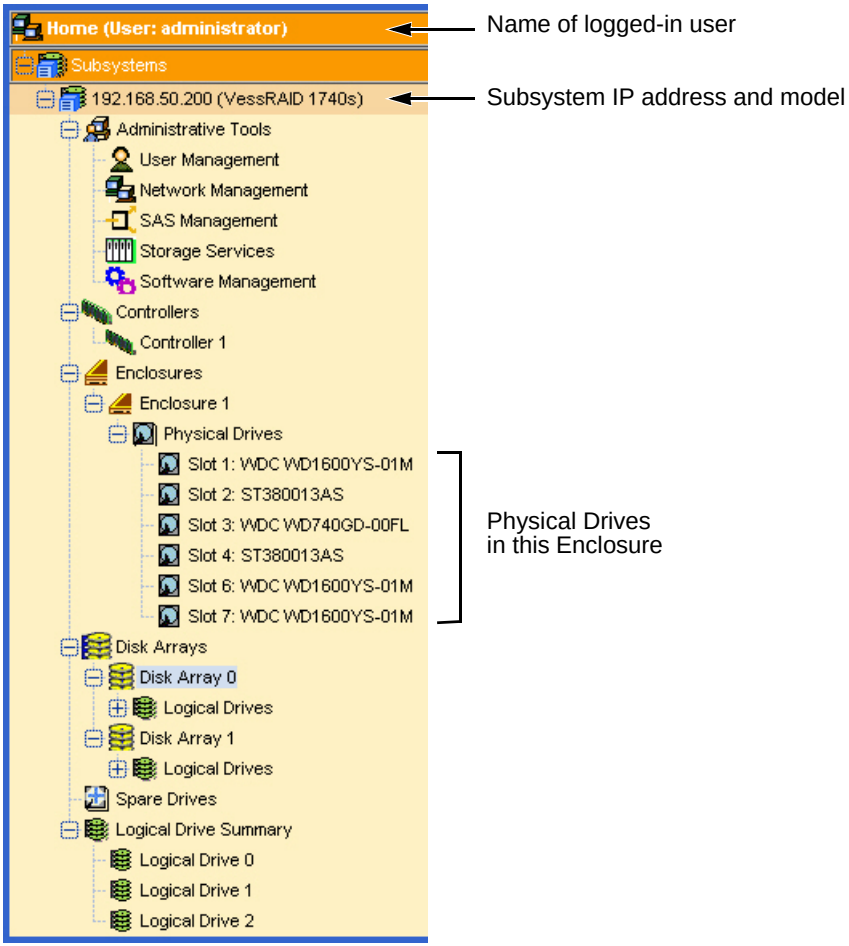
The Header contains the following items:

- **Language** – To change languages, see “Selecting a Language” on page 43.
- **View** – To view the Event Frame, see “Viewing the Event Frame” on page 47.
- **Storage Network** – To view all of the VessRAID subsystem enclosures currently accessible the network, see “Working with the Storage Network” on page 49.
- **Contact Us** – Click **Contact Us** for a list of contact information, including Technical Support. Also see “Contacting Technical Support” on page 305.
- **Logout** – To log out of WebPAM PROe, see page 48.
- **Help** – Click **Help** in the Header to access the main online help menu.
- **About** – Click **About** in the Header to display the WebPAM PROe software version and build date.

Using Tree View

Tree View enables you to navigate around all components of the Subsystem, including SAS management, network and service management, RAID controller, enclosure, physical drives, disk arrays, logical drives, and spare drives. The figure below shows the components of Tree View.

Figure 4. WebPAM PROe Tree View



Using Management View

Management View provides the actual user interface with the VessRAID, including creation, maintenance, deletion, and monitoring of disk arrays and logical drives.

Function Tabs control specific actions and processes. This window changes depending on which item you choose in Tree View and which tab you choose in Management View itself.

Click the **Help** button in Management View to access online help for the function that is currently displayed.

Viewing the Event Frame

To view the Event Frame:

1. Click **View** in the Header.
2. Click the *Show Event Frame* popup option.

   The VessRAID user interface will display the Event Frame below Management View.
3. Click **View** again to hide the Event Frame.

In the event frame, events are listed and sorted by:

- **Item Number** – A consecutive decimal number assigned to a specific event
- **Device** – Battery, controller, logical drive, physical drive, port, etc.
- **Event ID** – The hexadecimal number that identifies the specific type of event
- **Severity** – Information, Warning, Minor, Major, Critical, and Fatal. The severity level is user-specified. See “Setting-up User Event Subscriptions” on page 61.
- **Time** – Time and date of the occurrence
- **Description** – A brief description of the event

Sorting Events

You can sort the events by Item Number, Device, Event ID, Severity, Time and Date, or Description.

Click the link at the top of the column by which you want to sort the events. After you click the item, a triangle icon appears.

- If the triangle points upward, the column is sorted low-to-high or old-to-new.
- If the triangle points downward, the column is sorted high-to-low or new-to-old.

Click the link a second time to change to flip the triangle and reverse the sort sequence.

Logging out of WebPAM PROe

There are two ways to log out of WebPAM PROe:

- Close your browser window
- Click **Logout** on the WebPAM PROe banner

Figure 5. Clicking "Logout" on the WebPAM PROe banner

Clicking **Logout** brings you back to the Login Screen. See page 43.

After logging out, you must enter your user name and password in order to log in again.

Working with the Storage Network

When you log into WebPAM PROe, you access a specific VessRAID subsystem. See “Logging into WebPAM PROe” on page 42.

The Storage Network feature enables you to access all of the VessRAID subsytems with a Management Port connection to your network.

Each VessRAID subsystem is identified by its Management Port IP address.

Storage Network functions include:

- Viewing other subsystems
- Updating the list of subsystems
- Logging into a subsystem
- Hiding the other subsystems

Viewing Other Subsytems

To view the other VessRAID subsytems the Storage Network:

1. Click **Storage Network** in the Header.
2. Click the *Show Network Subsystems* popup option.

   The list will show all subsystems the network at the time the GUI was launched.

Updating the List of Subsystems

To update the list of the VessRAID subsytems the Storage Network:

Click the **Discover** button at the bottom of the subsystem list.

Logging into a Subsystem

To log into any of the displayed VessRAID subsystems:

1. In Tree View, click the Subsystem icon of the subsystem you want to see.

   If your user name and password do not match the subsystem you are logging into, the log in screen will appear.
2. Log into the new subsystem, as needed.

Hiding the Other Subsystems

To hide the other VessRAID subsystems the Storage Network:

1. Click **Storage Network** in the Header.
2. Click the *Hide Network Subsystems* popup option.

Working with Subsystems

A VessRAID subsystem is identified by its Management Port IP address. Subsystem functions include:

- Viewing Subsystem Information (page 50)
- Saving System Service Report (page 50)
- Setting an Alias for the Subsystem (page 51)
- Setting Subsystem Date and Time (page 51)
- Viewing the Runtime Event Log (page 51)
- Saving the Runtime Event Log (page 52)
- Clearing the Runtime Event Log (page 52)
- Viewing NVRAM Events (page 52)
- Saving NVRAM Events (page 53)
- Clearing NVRAM Events (page 53)
- Viewing Current Background Activities (page 54)
- Making Background Activity Settings (page 54)
- Running Background Activities (page 55)
- Running Media Patrol (page 55)
- Running PDM (page 56)
- Viewing Scheduled Activities (page 56)
- Scheduling an Activity (page 56)
- Deleting a Scheduled Activity (page 57)
- Viewing Lock Status (page 58)
- Setting the Lock (page 58)
- Renewing the Lock (page 58)
- Releasing the Lock (page 59)

Viewing Subsystem Information

To view information about a subsystem, click the Subsystem icon in Tree View. Management View displays the subsystem information.

Saving System Service Report

To save a System Service Report as a text file on your Host PC:

1. In Tree View, click the Subsystem icon.
2. On the Information tab, click the **Save** button.
3. Direct your browser where to save the configuration and status file.

Setting an Alias for the Subsystem

An alias is optional. To set an alias for this subsystem:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Settings** tab.
3. Enter a name into the Alias field.

   Maximum of 48 characters. Use letters, numbers, space between words, and underscore.
4. Click the **Submit** button.

Setting Subsystem Date and Time

To set a Date and Time for this subsystem:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Settings** tab dropdown menu and choose *Date and Time* Settings.
3. Under Subsystem Date, choose the Month and Day from the dropdown menus.
4. Type the current year into the Year field.
5. Under Subsystem Time, choose the Hour, Minutes and Seconds from the dropdown menus.
6. Click the **Submit** button.

Viewing the Runtime Event Log

Runtime Events lists information about the 1023 most recent runtime events recorded since the system was started. To view runtime events:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Events** tab dropdown menu and choose *Runtime Events*.

   Events are displayed by:

   - **Item Number** – A consecutive decimal number assigned to a specific event
   - **Device** – Battery, controller, logical drive, physical drive, port, etc.
   - **Event ID** – The hexadecimal number that identifies the specific type of event
   - **Severity** – Information, Warning, Minor, Major, Critical, and Fatal. The severity level is user-specified. See “Setting-up User Event Subscriptions” on page 61.

- **Time** – Time and date of the occurrence
- **Description** – A brief description of the event

3. Click the link at the top of the column by which you want to sort the events. After you click the item, a triangle icon appears.
   - If the triangle points upward, the column is sorted low-to-high or old-to-new.
   - If the triangle points downward, the column is sorted high-to-low or new-to-old.

   Click the link a second time to change to flip the triangle and reverse the sort sequence.

Saving the Runtime Event Log

To save the runtime event log as a text file:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Events** tab dropdown menu and choose *Runtime Events*.
3. Click the **Save Event Log** button.
4. In the File Download dialog box, click the **Save** button.
5. In the Save dialog box, name the file, navigate to the folder where you want to save the log file, and click the **Save** button.

Clearing the Runtime Event Log

To clear the runtime event log:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Events** tab dropdown menu and choose *Runtime Events*.
3. Click the **Clear Event Log** button.
4. In the Confirmation dialog box, type **confirm** and click the **OK** button.

Viewing NVRAM Events

NVRAM Events lists information about the 63 most recent important events. NVRAM events are stored in non-volatile memory. To view runtime events:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Events** tab dropdown menu and choose *System Events in NVRAM*.

   Events are displayed by:

- **Item Number** – A consecutive decimal number assigned to a specific event
- **Device** – Battery, controller, logical drive, physical drive, port, etc.
- **Event ID** – The hexadecimal number that identifies the specific type of event
- **Severity** – Information, Warning, Minor, Major, Critical, and Fatal. The severity level is user-specified. See “Setting-up User Event Subscriptions” on page 61.
- **Time** – Time and date of the occurrence
- **Description** – A brief description of the event

3. Click the link at the top of the column by which you want to sort the events. After you click the item, a triangle icon appears.
   - If the triangle points upward, the column is sorted low-to-high or old-to-new.
   - If the triangle points downward, the column is sorted high-to-low or new-to-old.

   Click the link a second time to change to flip the triangle and reverse the sort sequence.

Saving NVRAM Events

To save the NVRAM event log as a text file:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Events** tab dropdown menu and choose *System Events in NVRAM*.
3. Click the **Save Event Log** button.
4. In the File Download dialog box, click the **Save** button.
5. In the Save dialog box, name the file, navigate to the folder where you want to save the log file, and click the **Save** button.

Clearing NVRAM Events

To clear the NVRAM event log:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Events** tab dropdown menu and choose *System Events in NVRAM*.
3. Click the **Clear Event Log** button.
4. In the Confirmation dialog box, type **confirm** and click the **OK** button.

Viewing Current Background Activities

To view the current background activities:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Background Activities** tab.

   A list of current background activities appears, including:

   - Rebuild
   - PDM (Predictive Data Migration)
   - Synchronization
   - Redundancy Check
   - Migration
   - Transition
   - Initialization
   - Media Patrol

Making Background Activity Settings

To make settings for background activities:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Background Activities** tab and choose *Settings* from the dropdown menu.
3. Click the dropdown menu to choose a priority of *Low*, *Medium*, and *High* for the following functions:

   - **Rebuild** – Rebuilds the data from a failed drive in a disk array
   - **Synchronization** – Checks the data integrity on disk arrays
   - **Initialization** – Sets all data bits in the logical drive to zero
   - **Redundancy Check** – Checks, reports and can correct data inconsistencies in logical drives
   - **Migration** – Change RAID level or add physical dries to disk arrays
   - **PDM** – Looks for bad blocks the physical drives of disk arrays
   - **Transition** – Returns a revertible spare drive to spare status

   The rates are defined as follows:

   - **Low** – Fewer resources to activity, more to data read/write.
   - **Medium** – Balance of resources to activity and data read/write.
   - **High** – More resources to activity, fewer to data read/write.

4. Highlight the following PDM trigger settings and type a value into the corresponding field:

- **Reassigned Block Threshold** – 1 to 512 blocks
- **Error Block Threshold** – 1 to 1024 blocks

5. Check to enable or uncheck to disable the following functions:
   - **Media Patrol** – Checks the magnetic media on physical drives
   - **Auto Rebuild** – If there is a spare drive of adequate capacity, a critical disk array will begin to rebuild automatically. If not spare drive is available, the disk array will begin to rebuild as soon as you replace the failed physical drive with an unconfigured physical drive of equal or greater size.
6. Click the **Submit** button to save your settings.

Running Background Activities

To run a background activity from the Background Activities tab:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Background Activities** tab and choose one of the following from the dropdown menu.
   - **Media Patrol** – See “Running Media Patrol” on page 55
   - **Rebuild** – See “Rebuilding a Disk Array” on page 114
   - **PDM** – See “Running PDM” on page 56
   - **Transition** – See “Transitioning a Disk Array” on page 116
   - **Initialization** – See “Initializing a Logical Drive” on page 120
   - **Redundancy Check** – See “Running Redundancy Check” on page 121
3. In the next screen, make the choices as requested.
4. Click the **Start** button.

Running Media Patrol

Media Patrol checks the magnetic media on physical drives. When it finds the specified number of bad blocks, it will trigger PDM. See “Making Background Activity Settings” on page 54 and “Running PDM” on page 56.

You can schedule Media Patrol to run automatically, see “Scheduling an Activity” on page 56.

To run Media Patrol:

1. In Tree View, click the Subsystem icon.
2. From the dropdown menu on the Background Activities tab, choose *Start Media Patrol*.
3. In the next screen, click the **Start** button.

Running PDM

Predictive Data Migration (PDM) migrates data from the suspect physical drive to a spare disk drive, similar to Rebuilding. But unlike Rebuilding, PDM acts *before* the disk drive fails and your Logical Drive goes Critical.

You an also run PDM on a specific disk array, see “Running PDM on a Disk Array” on page 116.

Also see “Predictive Data Migration (PDM)” on page 260.

To run PDM:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the **Background Activities** tab and choose *Start Media Patrol* from the dropdown menu.
3. In the next screen, choose the Source and Target physical drives.

   The suspect physical drive is the source. The replacement physical drive is the target.
4. Click the **Start** button.

Viewing Scheduled Activities

To view scheduled activities for this subsystem:

1. Click the Subsystem icon Tree View.
2. Click the **Scheduler** tab in Management View.

Scheduling an Activity

To set a scheduled activity for this subsystem:

1. Click the Subsystem icon Tree View.
2. From the dropdown menu on the Scheduler tab, choose an item:
   - Media Patrol. See “Running Media Patrol” on page 55
   - Redundancy Check. See “Running Redundancy Check” on page 121
   - Battery Reconditioning. See “Reconditioning a Battery” on page 94
   - Spare Drive Check. See “Running Spare Check” on page 127
3. In the Scheduler dialog box, check the Enable This Schedule box.
4. Select a start time (24-hour clock).

5. Select a Recurrence Pattern.
   - **Daily** – Enter the number of days between events.
   - **Weekly** – Enter the number of weeks between events and choose which days of the week.
   - **Monthly** – Choose a calendar day of the month (1 – 31).

   If you choose a higher number than there are days in the current month, the actual start date will occur at the beginning of the following month.

   Or, choose a day of the week and choose the first, second, third, fourth, or last occurrence of that day in the month.

   Then, choose the months in which you want the activity to occur.
6. Select a Range of Occurrence.
   - Start-from date. The default is today's date.
   - End-on date.

   Select No End Date (perpetual).

   Or, choose a number of occurrences for this activity.

   Or, choose a specific end date. The default is today's date.
7. For Redundancy Check only:
   - Choose the Auto Fix option. This feature attempts to repair the problem when it finds an error.
   - Choose the Pause on Error option. This feature stops the process when it finds an error
   - Check the boxes beside the logical drives (all except RAID 0) to which this activity will apply.

     Each logical drive can have only one scheduled Redundancy Check.

Note

You can schedule only ONE Redundancy Check for each logical drive.

8. Click the **Submit** button.

Deleting a Scheduled Activity

To delete a scheduled activity for this subsystem:

1. Click the Subsystem icon Tree View.
2. From the dropdown menu on the Scheduler tab, choose *Delete Schedules*.
3. Check the box to the left of the schedule you want to delete.
4. Click the **Submit** button.

Viewing Lock Status

The lock prevents other sessions (including by the same user) from making a configuration change to the controller until the lock expires or a forced unlock is done.

To view the lock status for this subsystem:

1. Click the Subsystem icon Tree View.
2. Click the **Lock** tab in Management View.

   The following information is displayed:

   - **Lock Status** – The User who set (owns) the current lock.
   - **Expiration Time** – Amount of time left until the lock automatically releases.
   - **Expire At Time** – The date and time when the lock will automatically release.

Setting the Lock

The lock prevents other sessions (including by the same user) from making a configuration change to the controller until the lock expires or a forced unlock is done.

You can set the lock to last from one minute to one day. To set the lock for this subsystem:

1. Click the Subsystem icon Tree View.
2. Click the **Lock** tab in Management View.
3. Click the **Lock** option.
4. Enter a time interval between 1 and 1440 minutes (one day) that you want the lock to stay active.
5. Click the **Submit** button.

Renewing the Lock

The lock prevents other sessions (including by the same user) from making a configuration change to the controller until the lock expires or a forced unlock is done.

Renewing the lock extends the period of time the controller remains locked. To renew an existing lock for this subsystem:

1. Click the Subsystem icon Tree View.
2. Click the **Lock** tab in Management View.
3. Click the **Renew** option.

4. Enter a time interval between 1 and 1440 minutes (one day) that you want the lock to stay active.

   The renew time replaces the previous Expiration Time.

5. Click the **Submit** button.

Releasing the Lock

The lock prevents other sessions (including by the same user) from making a configuration change to the controller until the lock expires or a forced unlock is done.

When the user who locked the controller logs out, the lock is automatically released. You can also release the lock before the scheduled time.

To release the lock for this subsystem:

1. Click the Subsystem icon Tree View.
2. Click the **Lock** tab in Management View.

   If you are the User who set the lock, click the **Unlock** option.

   If another User set the lock and you are a Super User, click the **Unlock** option and check the **Force Unlock** box.

3. Click the **Submit** button.

Managing Users

User Management includes all functions dealing with user accounts. Functions include:

- Viewing User Information (page 60)
- Making User Settings (page 60)
- Making Your Own User Settings (page 61)
- Setting-up User Event Subscriptions (page 61)
- Changing Another User's Password (page 62)
- Changing Your Own Password (page 62)
- Creating a User (page 63)
- Deleting a User (page 64)
- Viewing User Sessions (page 64)
- Logging out Other Users (page 64)

Viewing User Information

The view a list of users, their status, access privileges, display name, and email address:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the User Management icon.

   The Information tab appears in Management View.

Making User Settings

To change settings of other users:

1. Log into WebPAM PROe as the Administrator or a Super User.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. On the Information tab, click the link of the user whose settings you want to change.

   The Settings screen for the selected user displays.
6. Make the following settings as needed.
   - Check the Enable box to enable this user.
   - Uncheck the box to disable this user.
   - Enter or change the display name.

- Enter or change the email address.
- From the Privilege dropdown menu, choose a new level.

  See “List of User Privileges” on page 63

7. Click the **Submit** button.

The Administrator or Super User can change another user’s password. See “Changing Another User’s Password” on page 62 for more information.

Making Your Own User Settings

To change your own user settings:

1. Log into WebPAM PROe under your own user name.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. Click the **Settings** tab in Management View.
6. Enter or change the display name or mail address.
7. Click the **Submit** button.

Setting-up User Event Subscriptions

An event subscription enables a user to receive email messages about events taking place in the VessRAID subsystem. To make or change user event subscriptions:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the User Management icon.
4. Click the **Event Subscription** tab in Management View.
5. Check the box to enable event notification.
6. Under the subheadings, choose the lowest level of Severity to be reported for each event. The selected level plus all higher levels of Severity will be reported.
   - **Information** – Information only, no action is required
   - **Warning** – User can decide whether or not action is required
   - **Minor** – Action is needed but the condition is not a serious at this time
   - **Major** – Action is needed now
   - **Critical** – Action is needed now and the implications of the condition are serious

- **Fatal** – Non-Recoverable error or failure has occurred
- **None** – Deactivates this event for notification purposes

7. Click the **Submit** button.

The user's account must have an email address. See "Making User Settings" on page 60.

For information about the email service, see "Making Email Settings" on page 71.

To send a test message to the email address in the listed under General Info, click the **Test Email** button.

Changing Another User's Password

To change a user's password:

1. Log into WebPAM PROe as the Administrator or a Super User.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. In the list of users, click the link of the user whose settings you want to change.

   The Settings screen for the selected user displays.
6. Click the **Password** tab in Management View.
7. Enter a new password of 1 to 31 characters, no spaces, in the New Password field.
8. Enter the new password in the Retype Password field.
9. Click the **Submit** button.

Changing Your Own Password

To set or change your own password:

1. Log into WebPAM PROe under your own user name.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. Click the **Password** tab in Management View.
6. Enter the current password in the Old Password field.

   If you do not have a password, leave this field blank.
7. Enter a new password of 1 to 31 characters, no spaces, in the New Password field.

8. Enter the new password in the Retype Password field.
9. Click the **Submit** button.

Creating a User

To create a user:

1. Log into WebPAM PROe as the Administrator or a Super User.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. Click the **Create** tab in Management View.
6. Enter a user name of 1 to 31 characters, no spaces, in the User Name field.
7. Enter a password of 1 to 31 characters, no spaces, in the New Password and Retype Password fields.

   A password is optional. If you do not specify a password, log into WebPAM PROe with the User Name and leave the password field blank.
8. Enter a display name in the Display Name field.

   A display name is optional.
9. Enter the user's email address in the Email Address field.

   An email address is required in order to receive email event notification.
10. Select a privilege level from the Privilege dropdown menu.

    For definitions of each privilege level, see the List of User Privileges below.
11. Check the Enabled box to enable this user on this subsystem.
12. Click the **Submit** button.

List of User Privileges

- **View** – Allows the user to see all status and settings but not to make any changes
- **Maintenance** – Allows the user to perform maintenance tasks including Rebuilding, PDM, Media Patrol, and Redundancy Check
- **Power** – Allows the user to create (but not delete) disk arrays and logical drives, change RAID levels, change stripe size; change settings of components such as disk arrays, logical drives, physical drives, and the controller.
- **Super** – Allows the user full access to all functions including create and delete users and changing the settings of other users, and delete disk arrays and logical drives. The default “administrator” account is a Super User.

Deleting a User

There will always be at least one Super User account. You cannot delete the user account you used to log in.

To delete a user:

1. Log into WebPAM PROe as the Administrator or a Super User.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. Click the **Delete** tab in Management View.
6. Check the box to the left of the user you want to delete.
7. Click the **Submit** button.
8. Click **OK** in the confirmation box.

Viewing User Sessions

To view the current sessions:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the User Management icon.
4. Click the **Sessions** tab in Management View.

Logging out Other Users

To logout other users:

1. Log into WebPAM PROe as the Administrator or a Super User.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. Click the **Sessions** tab in Management View.
6. Check the box to the left of the user you want to log out.
7. Click the **Logout** button.
8. Click **OK** in the confirmation box.

Managing the Network Connection

The network connection deals with the VessRAID's Management Port.

- Making Management Port Settings (below)

Making Management Port Settings

When you log into WebPAM PROe over your network, you use the VessRAID's management port.

Before you change settings, please see "Choosing DHCP or a Static IP Address" on page 26.

To make changes to the Management Port settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Network Management icon.
4. Click the **Port Configuration** link in Management View.
5. To enable DHCP, check the DHCP box.

   When DHCP is NOT enabled, enter:

   - Primary IP address
   - Primary subnet mask
   - Default gateway IP address
   - Enter a primary DNS server IP address.
6. Click the **Submit** button.

Managing SAS Connections

SAS connections deal with the VessRAID's two host data ports.

- Viewing SAS Port Information (page 66)
- Making SAS Port Settings (page 66)
- Viewing SAS Port Statistics (page 67)
- Viewing SAS Initiators (page 67)

Viewing SAS Port Information

The SAS Controller has one SAS channel. The SAS channel has two ports.

See "Making Data and Management Connections" on page 18 for information about how these ports are physically connected to the Host PC.

To view information about the SAS ports:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the SAS Management icon.

   The port information appears the screen.
   - Channel ID
   - Port Type
   - Link Status
   - Link Speed
   - SAS Address
   - Cable Signal Strength (adjustable under Port Settings)

Making SAS Port Settings

The SAS Controller has one SAS channel. The SAS channel has two ports.

See "Making Data and Management Connections" on page 18 for information about how these ports are physically connected to the Host PC.

To make settings to the SAS ports:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the SAS Management icon.
4. In Management View, click the **Port 1** or **Port 2** link.
5. From the Cable Signal Strength dropdown menu, choose a value.

The range is 1 to 8. 1 is the default. Signal strength correlates to cable length in meters. Example: If you have a 2 m SAS cable, set signal strength to 2. If performance is unsatisfactory (see “Viewing SAS Port Statistics” on page 67), try settings of 1 and 3, then use the best setting for your system.

6. Click the **Submit** button.

Viewing SAS Port Statistics

The SAS Management Statistics tab displays statistical information about the SAS ports on the VessRAID subsystem.

To view information about the SAS ports:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the SAS Management icon.
4. In Management View, click the **Statistic** tab.

   The statistics for the selected port appear the screen.

Clearing Statistics

To clear statistics, see “Clearing Statistics” on page 81.

Viewing SAS Initiators

You must add an initiator to the VessRAID's initiator list in order to use the initiator to create a LUN for your logical drive.

To view a list of recognized initiators:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the SAS Management icon.
4. In Management View, click the **Initiators** tab.

   A list of all currently logged-in initiators appears the screen.

Adding an Initiator

To add an initiator to the VessRAID’s initiator list:

1. Check the box to the left of the initiator.
2. Click the **Add to Initiator List** button.

The initiator appears under Storage Services. See page 68. You can then use the initiator to create a LUN. See “Adding a LUN Map” on page 69.

Managing Storage Services

Storage services deal with initiators and LUN mapping. LUN masking is the process of applying a LUN Map so that each initiator can only access the LUNs specified for it.

Features include:

- Adding an Initiator (page 68)
- Deleting an Initiator (page 68)
- Viewing the LUN Map (page 69)
- Enabling LUN Masking (page 69)
- Adding a LUN Map (page 69)
- Editing a LUN Map (page 70)

Adding an Initiator

You must add an initiator to the VessRAID's initiator list in order to use the initiator to create a LUN

To add an initiator:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Storage Services icon.
4. Click the **Initiators** tab in Management View.
5. From the Initiators tab dropdown menu, choose *Add Initiator*.
6. Enter the initiator's name in the Initiator Name field.

   A SAS initiator name is the SAS address of the HBA card in the Host PC. Obtain the initiator name from the initiator utility on your host system.

   Obtain the initiator name from the initiator utility on your host system.

   Note that the initiator name you input must match exactly in order for the connection to work.
7. Click the **Submit** button.

You can also add initiators from the Initiators tab. See “Viewing SAS Initiators” on page 67.

Deleting an Initiator

To delete an initiator:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.

3. Click the Storage Services icon.
4. Click the **Initiators** tab in Management View.
5. From the Initiators tab dropdown menu, choose *Delete Initiators*.
6. Check the box to the left of the initiator you want to delete.
7. Click the **Submit** button.

Viewing the LUN Map

To view the current LUN Map:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Storage Services icon.
4. Click the **LUN Map** tab in Management View.

Enabling LUN Masking

To enable the LUN Masking:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Storage Services icon.
4. Click the **LUN Map** tab in Management View.
5. Click the **LUN Masking Enabled** box.
6. Click the **Submit** button.

Adding a LUN Map

To edit the LUN Map:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Storage Services icon.
4. Click the **LUN Map** tab in Management View and from the dropdown menu, choose *Add a LUN Map*.
5. Choose an initiator from the Initiator dropdown list.

   Or enter the initiator's name in the Initiator Name field.

   Note that the initiator name you input must match exactly in order for the connection to work.
6. In the LUN Mapping & Masking list, enter the LUNs for each logical drive.

You must enter different LUN numbers for each logical drive.

7. Click the **Submit** button.

Editing a LUN Map

To edit the LUN Map:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Storage Services icon.
4. Click the **LUN Map** tab in Management View.
5. From the LUN Mapping & Masking Information list, choose an initiator and click its link.

   Or enter the initiator's name in the Initiator Name field.

   Note that the initiator name you input must match exactly in order for the connection to work.
6. In the LUN field, enter the LUNs for each logical drive.

   You must enter different LUN numbers for each logical drive.
7. Click the **Submit** button.

Managing Software Services

Software Services include the following functions:

- Making Email Settings (page 71)
- Making SLP Settings (page 72)
- Making Web Server Settings (page 73)
- Making Telnet Settings (page 74)
- Making SNMP Settings (page 74)
- Making Netsend Settings (page 76)

Making Email Settings

The Email sends notification messages to users. See Setting-up User Event Subscriptions (page 61).

To make Email service settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Email Setting** link in Management View.
4. Enter the IP address for your SMTP server.
5. Enter server port number for your SMTP server.

   25 is the default.
6. Choose Yes to enable SMTP authentication or No to disable.
7. If you chose Yes for SMTP authentication, enter a Username and Password in the fields provided.
8. Enter an Email sender address (example: RAIDmaster@mycompany.com).
9. Enter an Email subject (example: VessRAID Status).
10. Click the **Submit** button.

Sending a Test Message

To send one test message to the User currently logged into WebPAM PROe:

1. Under Test Email, check the “Send A Test Email” box.
2. Click the **Submit** button.

If you do not receive the Test Email message, see your Network Administrator for assistance with the mail server setup, email accounts, and other issues.

Changing the Startup Setting

1. Under Startup Type:
   - Click the **Automatic** option to start the service automatically during system startup. Recommended.
   - Click the **Manual** option to start the service manually (the service does not start during system startup).
2. Click the **Submit** button.

Stopping Email service

To stop the Email service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting Email service

To start or restart the Email service, click the **Start** or **Restart** button.

Making SLP Settings

VessRAID's SLP service discovers services available over the Internet. To make SLP service settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Software Management icon.
4. Click the **SLP** link.
5. Choose the Startup Type.
   - Click the **Automatic** option to start the service automatically during system startup. Recommended.
   - Click the **Manual** option to start the service manually (the service does not start during system startup).
6. Click the **Submit** button.

Stopping SLP service

To stop the SLP service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting SLP service

To start or restart the SLP service, click the **Start** or **Restart** button.

Making Web Server Settings

The Web Server service connects your browser to the WebPAM PROe GUI on the VessRAID subsystem.

To make Web Server settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Web Server Setting** link in Management View.
4. Enter the HTTP Port number.

   80 is the default.
5. Enter Session Time Out interval.

   This setting causes WebPAM PROe to time-out after a period of inactivity. 24 minutes is the default. The range is 1 to 1440 minutes (one day).
6. If you want to use a secure connection, check the Enable SSL box.
7. If you checked the Enable SSL box, enter a HTTPS Port number.

   443 is the default.
8. If you want to download a SSL Certificate, check the Download Certificate box.
9. If you checked the Download Certificate box, enter the Certificate filename or click the Browse... button to locate it.
10. Click the **Submit** button.
11. Click **OK** in the confirmation box to restart the Web Server service with your changes.

Changing the Startup Setting

1. Under Startup Type:
   - Click the **Automatic** option to start the service automatically during system startup. Recommended.
   - Click the **Manual** option to start the service manually (the service does not start during system startup).
2. Click the **Submit** button.

Stopping Web Server service

To stop the Web Server service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting Web Server service

To start or restart the Web Server service, click the **Start** or **Restart** button.

Making Telnet Settings

VessRAID's Telnet service enables you to access VessRAID's Command Line Interface (CLI) through a network connection. To make Telnet settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Telnet Setting** link in Management View.
4. Enter the Telnet Port number.

   2300 is the default.
5. Enter the Maximum Number of Connections.

   4 is the default.
6. Enter the Session Time Out interval.

   24 minutes is the default.
7. Click the **Submit** button.
8. Click **OK** in the confirmation box to restart the Telnet service with your changes.

Changing the Startup Setting

1. Under Startup Type:
   - Click the **Automatic** option to start the service automatically during system startup. Recommended.
   - Click the **Manual** option to start the service manually (the service does not start during system startup).
2. Click the **Submit** button.

Stopping Telnet service

To stop the Telnet service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting Telnet service

To start or restart the Telnet service, click the **Start** or **Restart** button.

Making SNMP Settings

VessRAID's SNMP service enables the SNMP browser to obtain information from the VessRAID. The Trap Sink is where SNMP events are sent and can be viewed.

To change the SNMP settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **SNMP Management** link in Management View.
4. Enter the SNMP Port number.

   161 is the default.
5. Enter a System Name.

   There is no default name.
6. Enter a System Location.

   USA is the default.
7. Enter a System Contact (the email address of the administrator or other individual).
8. Enter the Read Community.

   Public is the default.
9. Enter the Write Community.

   Private is the default.

   To add a Trap Sink, see “Adding Trap Sinks” below.
10. Click **OK** in the confirmation box to restart the SNMP service with your changes.

Adding Trap Sinks

To add a trap sink:

1. Enter a Trap Sink IP address.
2. Select a Trap Filter, choose the lowest level of Severity to be reported for each event.

   See “Setting-up User Event Subscriptions” on page 61 for an explanation of the Severity levels.
3. Click the **Update** button.

   The new trap sink appears in the Trap Sinks list.
4. Click the **Submit** button.
5. Click **OK** in the confirmation box.

Deleting Trap Sinks

To delete a trap sink:

1. Highlight the trap sink you want to delete from the list.
2. Click the **Delete** button to remove the trap sink from the list.
3. Click the **Submit** button.

4. Click **OK** in the confirmation box.

Changing the Startup Setting

1. Under Startup Type:
   - Click the **Automatic** option to start the service automatically during system startup. Recommended.
   - Click the **Manual** option to start the service manually (the service does not start during system startup).
2. Click the **Submit** button.

Stopping SNMP service

To stop the SNMP service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting SNMP service

To start or restart the SNMP service, click the **Start** or **Restart** button.

Making Netsend Settings

VessRAID's Netsend service sends VessRAID subsystem events in the form of text messages to your Host PC and other networked PCs. This service is normally Stopped and set to Manual start. See "Netsend Requirements" on page 77.

To change the Netsend settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Netsend** link.
4. Click the **Start** button to start the Netsend service.
5. Click the **Submit** button.

Adding Netsend recipients

See "Netsend Requirements" on page 77. To add a Netsent recipient:

1. In the Recipient Address field, type the IP address of the recipient PC.
2. Under Recipient filter, choose the lowest level of Severity to be reported for each event.

   See "Setting-up User Event Subscriptions" on page 61 for an explanation of the Severity levels.
3. Click the **Update** button to add the new recipient to the list
4. Click the **Submit** button.

5. Click **OK** in the confirmation box.

Deleting Netsend Recipients

To delete a Netsend recipient:

1. Highlight the recipient you want to delete in the recipient list.
2. Click the **Delete** button to remove the recipient from the list.
3. Click the **Submit** button.
4. Click **OK** in the confirmation box.

Changing the Startup Setting

1. Under Startup Type:
   - Click the **Automatic** option to start the service automatically during system startup. Recommended if you plan to use this feature.
   - Click the **Manual** option to start the service manually (the service does not start during system startup). The default setting.
2. Click the **Submit** button.

Stopping Netsend service

To stop the Netsend service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting Netsend service

To start or restart the Netsend service, click the **Start** or **Restart** button.

Netsend Requirements

In order to use Netsend:

- Netsend must be running the VessRAID
- You must provide the IP address for each recipient PC
- The Messenger service must be running on each recipient PC

If your Netsend and Messenger service settings are correct but the recipient PC does not receive event messages, check the recipient PC's Firewall settings. Refer to your OS documentation for more information.

Exporting the User Database

You can export the User Database file to share user information and settings among multiple VessRAID subsystems.

The Export action saves a text file a designated folder the Host PC. From there, you can import the User Database file to other VessRAID subsystems.

To export the User Database file:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Export** link in Management View.
4. Click the **Export** button.
5. In the Opening export dialog box, click the **Save to Disk** option.
6. Click the **OK** button.

   The user database file is saved to the Host PC from which you access WebPAM PROe.

Note

The Encryption box is grayed out. Encryption is always enabled.

Importing a User Database

Caution

Do NOT use this function to update the VessRAID firmware.

The Software Management–Import tab enables you to import the User Database file from the Host PC's file system to the VessRAID subsystem. When you make user settings to one VessRAID, you can export the User Database file to the Host PC. From there, you can import the User Database file to other VessRAIDs so that all have the same User information and settings.

To import the User Database file to this subsystem:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Software Management icon.
4. Click the **Import** tab.

5. Under the Type dropdown list, choose *User Database*.
6. Enter the name of the file to be imported.

   Or, click the **Browse...** button to search for the file.

   Look for a file called *export*.
7. Click the **Submit** button.
8. Click the **Next** button.

   If the imported file is a valid user database, a warning will appear to inform you that it will overwrite the previous settings.
9. In the Warning box, click the **OK** button.

   This user settings are applied to this VessRAID subsystem.

Note

The Decryption box is grayed out. Decryption is enabled for user databases.

Importing a Configuration Script

The Software Management–Import tab enables you to import a Configuration Script to the VessRAID subsystem. You can write a CLI configuration script to automatically configure your VessRAID subsystem. The script must be a plain, non-encrypted text file. The Import function runs the script and performs the configuration automatically.

To import a Configuration Script to this subsystem:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Software Management icon.
4. Click the **Import** tab.
5. Under the Type dropdown list, choose *Configuration Script*.
6. Enter the name of the file to be imported.

   Or, click the **Browse...** button to search for the file.
7. Click the **Submit** button.
8. Click the **Next** button.

   If the imported file is a valid configuration script, a warning will appear to inform you that it will overwrite the previous settings.
9. In the Warning box, click the **OK** button.

The new configuration is applied to this VessRAID subsystem.

Note

The Decryption box is grayed out. Decryption is disabled for configuration scripts.

Updating the Firmware

See “Chapter 7: Maintenance” on page 219 for instructions.

Viewing Flash Image Information

Flash image information refers to the package of firmware components running on your VessRAID controller or controllers, including:

- Component name
- Version number
- Build date
- Flash (installation) date
- Controller number (1 or 2)

To view flash image information:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Software Management icon.
4. Click the **Image Version** tab.

   The flash image information displays on the screen.

   Running Image Info – The firmware package currently running on the controllers

   Flashed Image Info – The firmware package flashed to memory

If the Running and Flashed Images do not match, the VessRAID has not restarted since the firmware was last updated. Restart the VessRAID to run the Flashed firmware package. See “Restarting the Subsystem” on page 85.

Note that all of these components are upgraded together in a package. See “Updating the Firmware in WebPAM PROe” on page 219.

Restoring Factory Defaults

VessRAID includes a function to restore the default settings to its Firmware and Software settings.

Caution

The action of restoring default settings can disrupt your VessRAID functions. Use this feature only when necessary and only the settings that must reset to default in order to set them correctly.

To access the Restore Defaults feature:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.

   The Administrative Tools list appears.
3. Click the **Restore Factory Defaults** link at the bottom of the list in Management View.

   The Restore Factory Defaults screen appears.
4. Check the Firmware and Software functions you want to restore to default settings.
5. Click the **Submit** button.
6. In the confirmation box, type the word **confirm** in the field provided.
7. Click the **OK** button.

The functions you selected will be automatically restored to their default settings.

Clearing Statistics

The Clear Statistics function clears statistical data on controllers, SAS ports, physical drives, and logical drives. To clear statistical data:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Clear Statistics** link.

   The Clear Statistics tab appears in Management View.
4. Click the **Submit** button.
5. In the confirmation box, type the word **confirm** in the field provided.
6. Click the **OK** button.

Shutting Down the Subsystem

You can only do part of this function in WebPAM PROe. Additional action is required, as described below.

Important

If you have a JBOD Expansion, always power off the RAID subsystem first. Then power off the JBOD subsystems.

To shutdown the subsystem:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Shutdown link in Management View.

   A Shutdown or Restart tab will appear.
4. Do one of the following actions:
   - On the Shutdown or Restart tab, choose **Shutdown** from the dropdown menu.
   - On the Shutdown or Restart tab, choose **Poweroff** from the dropdown menu.
5. Click the **Submit** button.
6. In the confirmation box, type the word **confirm** in the field provided.
7. Click the **OK** button.

   When the controller shuts down, your WebPAM PROe connection will be lost.
8. Wait for no less than two minutes.

   Do one of the following actions:
   - If you chose the *Shutdown* Option, manually turn off the power supply switch (both switches with redundant power supplies) on the back of the subsystem.
   - If you chose the *Poweroff* Option, the subsystem powers down automatically. On subsystems with redundant power supplies, unplug the power cords and plug them back in, to activate the power switches.

Caution

After you power off the subsystem, wait at least 10 seconds before you power on the subsystem again.

Monitoring the Shutdown

To monitor a shutdown, you must use the Command Line Interface (CLI) though a serial connection to the VessRAID.

Turn off both power supply switches when the following this message appears:

Shutdown complete. It is now safe to power off the subsystem.

Starting Up After Shutdown

Important

If you have a JBOD Expansion, always power on the JBOD subsystems first. Then power on the RAID subsystem.

To start the RAID subsystem:

1. Manually turn on the power supply switches on the back of the subsystem.

   If the switches are ON but the subsystem is OFF, turn the switches off and on again.

   On subsystems with redundant power supplies, if the power switches do not respond, unplug the power cords and plug them back in. Try the power switches again.
2. Wait about two minutes.
3. Open your browser and log into WebPAM PROe.

   See “Logging into WebPAM PROe” on page 42.

   If you cannot log in, wait 30 seconds and try again.

Monitoring the Startup

To monitor a startup, you must use the Command Line Interface (CLI) though a serial connection to the VessRAID.

When the **Login:** prompt appears, the start up is finished.

Restarting the Subsystem

Note

If you have a JBOD Expansion, you are not required to restart the JBOD subsystems when you restart the RAID subsystem.

You can only do part of this function in WebPAM PROe. Additional action is required, as described below. To restart the subsystem

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Shutdown link in Management View.

   A Shutdown or Restart tab will appear.
4. On the Shutdown or Restart tab, choose *Restart* from the dropdown menu.
5. Click the **Submit** button.
6. In the warning box, click the **OK** button.
7. In the confirmation box, type the word **confirm** in the field provided.
8. Click the **OK** button.

   When the controller shuts down, your WebPAM PROe connection will be lost.
9. Wait for two to three minutes.
10. In your browser, log into WebPAM PROe once again.

    If you cannot log in, wait for 30 seconds, and try again. Repeat until login is successful.

Monitoring the Restart

To monitor a restart, you must use the Command Line Interface (CLI) though a serial connection to the VessRAID.

When the **Login:** prompt appears, the restart is finished.

Managing the Controller

The RAID controller is the heart of the VessRAID subsystem. Controller management includes the following functions:

- Viewing Controller Information (page 86)
- Viewing Controller Information (page 86)
- Viewing Controller Statistics (page 87)
- Making Controller Settings (page 87)
- Clearing an Orphan Watermark (page 88)

Viewing the Controller

To view information about the controller:

1. Click the Subsystem icon in Tree View.
2. Click the Controllers icon.

   The controller information appears under the Information tab in Management View. Controller information includes:

   - **Controller ID** – 1
   - **Alias** – if assigned
   - **Model** – if applicable
   - **Status** – OK means normal

Viewing Controller Information

To view Controller information:

1. Click the Subsystem icon in Tree View.
2. Click the Controllers icon.
3. Click the Controller icon.

   The controller information appears the Information tab in Management View.

Adjustable items

You can set or adjust the following items:

- Alias, if assigned
- Coercion, enable or disable
- Coercion Method
- SMART (Self-Monitoring, Analysis, and Reporting System for physical drives)
- SMART Polling Interval

- Write Back Cache Flush Interval
- Enclosure Polling Interval

See “Making Controller Settings” on page 87.

Upgradable items

You can upgrade the following items:

- Boot loader Version
- Firmware Version number
- Software Version number
- Memory Size

See “Chapter 7: Maintenance” on page 219.

Viewing Controller Statistics

To view controller statistics:

1. Click the Subsystem icon in Tree View.
2. Click the Controllers icon.
3. Click the Controller icon.
4. Click the **Information** tab in Management View and choose *Statistics* from dropdown menu.

Clearing Statistics

To clear statistics, see “Clearing Statistics” on page 81.

Making Controller Settings

To make Controller settings:

1. Click the Subsystem icon in Tree View.
2. Click the Controllers icon.
3. Click the Controller icon.
4. Click the **Settings** tab in Management View.

5. Make the following settings as needed:
   - Enter a name into the Alias field.

     Maximum of 48 characters. Use letters, numbers, space between words, and underscore. An alias is optional.
   - Check the SMART Log box to enable the Self-Monitoring, Analysis, and Reporting System (SMART).
   - Enter a polling interval (1 to 1440 minutes) in SMART Polling Interval field.
   - Check the Coercion Enabled box to enable disk drive capacity coercion.

     When disk drives of different capacities are used in the same array, coercion reduces the usable capacity of the larger disk drive(s) in order to match the smallest capacity drive.

     For more information, see “Capacity Coercion” on page 250.
   - Select a coercion method from the Coercion Method dropdown menu. The choices are:

     GB Truncate – (Default) Reduces the useful capacity to the nearest 1,000,000,000 byte boundary.

     10GB Truncate – Reduces the useful capacity to the nearest 10,000,000,000 byte boundary.

     Group Rounding – Uses an algorithm to determine how much to truncate. Results in the maximum amount of usable drive capacity.

     Table Rounding – Applies a predefined table to determine how much to truncate.
   - Enter a time interval (1 to 12 seconds) in the Write Back Cache Flush Interval field.

     For more information, see “Cache Policy” on page 248.
   - Enter a time interval (15 to 255 seconds) in the Enclosure Polling Interval field.
   - Check the Enable Adaptive Writeback Cache box to enable this function.

     For more information, see “Adaptive Writeback Cache” on page 249.
6. Click the **Submit** button.

   The changes take effect immediately.

Clearing an Orphan Watermark

An Orphan Watermark condition is the result of a disk drive failure during an NVRAM RAID level migration on a disk array.

To clear an Orphan Watermark:

1. Click the Subsystem icon in Tree View.
2. Click the Controllers icon.
3. Click the Controller icon.
4. Click the **Clear** tab in Management View.
5. Click the **Submit** button.

The changes take effect immediately.

Managing Enclosures

On VessRAID, enclosures include the main VessRAID subsystem or *Head Unit* as well as VessJBOD enclosures that are connected through expansion. Enclosure Management includes the following functions:

- Viewing the Enclosure (page 90)
- Locating an Enclosure (page 90)
- Viewing Enclosure Topology (page 91)
- Viewing Enclosure Information (page 91)
- Making Enclosure Settings (page 92)
- Viewing FRU VPD Information (page 92)
- Checking the Battery (page 93)
- Reconditioning a Battery (page 94)
- Silencing the Buzzer (page 94)
- Making Buzzer Settings (page 94)
- Testing the Buzzer (page 95)

Viewing the Enclosure

To view information about the enclosures:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.

   The following information is shown:

   - Enclosure ID number
   - Enclosure Type
   - Operational Status
   - Status Description (specific components in need of attention, if any)

Locating an Enclosure

To locate an enclosure (subsystem):

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the **Locate Enclosure** button.

   The disk status LEDs and the LEDs on the back of the enclosure blink for one minute. See the Figures below.

Figure 6. Disk Status LED

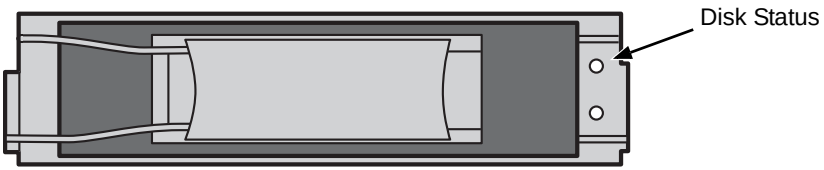
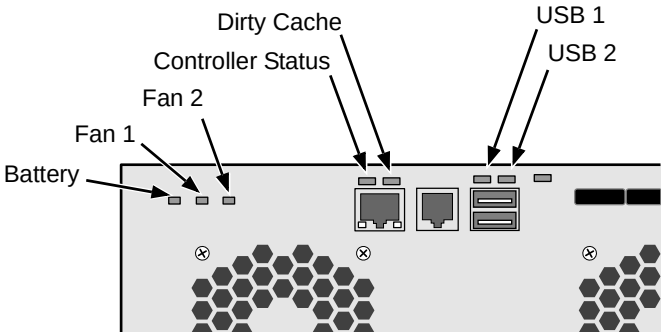


Figure 7. VessRAID enclosure LEDs



Viewing Enclosure Topology

To view Enclosure Topology:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the **Topology** tab in Management View.

Enclosure topology refers to the manner in which the data paths among the enclosures are connected:

- **Individual Subsystem** – One VessRAID subsystem
- **JBOD Expansion** – One VessRAID subsystem plus one or more VessJBOD expansion subsystems, managed through the VessRAID or head unit

The logical connections for these arrangements are shown the Enclosure Topology tab. The physical connections for these arrangements are discussed in “Chapter 2: VessRAID Installation” on page 9.

Viewing Enclosure Information

To view enclosure information:

1. Click the Subsystem icon in Tree View.

2. Click the Enclosures icon.
3. Click the Enclosure icon.

   Enclosure information appears the Information tab in Management View. You can monitor power supplies, fans, enclosure temperatures and voltages, and the battery.

Adjustable items

You can set or adjust the following items:

- Enclosure Warning and Critical temperature thresholds
- Controller Warning and Critical temperature thresholds

See “Making Enclosure Settings” on page 92.

For information on Enclosure problems, see “Chapter 9: Troubleshooting” on page 265.

Making Enclosure Settings

To make Enclosure settings:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the **Settings** tab in Management View.
5. Enter a value in the following fields as necessary:
   - Enclosure Warning Temperature Threshold
   - Enclosure Critical Temperature Threshold
   - Controller Warning Temperature Threshold
   - Controller Critical Temperature Threshold
6. Click the **Submit** button.

   The changes take effect immediately.

Viewing FRU VPD Information

FRU VPD refers to Vital Product Data (VPD) information about Field Replaceable Units (FRU) in the enclosure. The screen lists the battery backup unit and backplane.

To view FRU VPD information:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.

3. Click the Enclosure icon.
4. Click the **FRU VPD** tab in Management View.

Use this information when communicating with Technical Support and when ordering replacement units. For contact information, see “Contacting Technical Support” on page 305.

Checking the Battery

The Enclosure–Battery tab displays information about the cache backup battery (or batteries) in the VessRAID subsystem enclosure. To check the batteries:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the **Battery** tab in Management View.

Battery Notes

Each battery works with a controller. If the battery is present in the subsystem but the corresponding controller is not present, the battery will not appear in the interface.

If a battery does not reflect normal conditions and it is not currently under reconditioning, run the Recondition function before you replace the battery. See “Reconditioning a Battery” on page 94.

Reconditioning fully discharges, then fully recharges the battery. During reconditioning, if the Adaptive Writeback Cache function is enabled, the controller cache is set to *Write Thru*. After reconditioning, the cache is reset to *Write Back*. See “Making Controller Settings” on page 87.

If a battery reaches the threshold temperature while charging or discharging, the charge or discharge pauses and the blower runs at high speed until the battery temperature falls below the threshold.

If the battery does not maintain normal values after a Recondition, replace the battery. See “Replacing the Cache Battery” on page 228.

VessRAID automatically reconditions the battery every two months. To set the schedule, see “Scheduling an Activity” on page 56.

When you install a new battery, the cycle count shows 0. VessRAID automatically runs a recondition on the battery to verify it. If you restart the subsystem or controller before reconditioning is finished, the battery is charged to 100%, then reconditioning starts again.

Reconditioning a Battery

To recondition the battery:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the **Battery** tab in Management View.
5. From the Battery tab dropdown menu, choose *Recondition*.
6. Click the **Submit** button.

   Reconditioning fully discharges, then fully recharges the battery. During reconditioning, if the Adaptive Writeback Cache function is enabled, the controller cache is set to *Write Thru*. After reconditioning, the cache is reset to *Write Back*. See “Making Controller Settings” on page 87.

   VessRAID automatically reconditions the battery every two months. To set the recondition schedule, see “Scheduling an Activity” on page 56.

Silencing the Buzzer

The buzzer sounds to inform you that the VessRAID needs attention. See “VessRAID is Beeping” on page 265 for more information.

To silence the buzzer for the current trigger event:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the **Buzzer** tab in Management View.
5. Click the **Mute** button.

   The buzzer goes silent. If another trigger event occurs, the buzzer will sound again.

   To silence the buzzer for all trigger events, disable it under “Making Buzzer Settings.”

Making Buzzer Settings

To make buzzer settings:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.

4. In Management View, from the Buzzer tab dropdown menu, choose *Settings*.
5. Check the **Buzzer Enable** box to enable the buzzer.

   Uncheck the Buzzer Enable box if you do not want the buzzer to sound.
6. Click the **Submit** button.

Testing the Buzzer

You must enable the buzzer before you can test it.

To test buzzer function:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the **Buzzer** tab in Management View.
5. Click the **Sound** button.

   The buzzer will sound for one minute.

Managing Physical Drives

Managing Physical Drives deals with the physical disk drives installed in the VessRAID subsystem enclosure, including the following functions:

- Viewing a List of Physical Drives (page 96)
- Identifying a Physical Drive (page 96)
- Making Global Physical Drive Settings (page 97)
- Viewing Physical Drive Information (page 97)
- Viewing Physical Drive Statistics (page 98)
- Making Physical Drive Settings (page 98)
- Clearing Stale and PFA Conditions (page 99)
- Forcing a Physical Drive Offline or Online (page 100)
- Locating a Physical Drive (page 100)

Viewing a List of Physical Drives

To view a list of physical drives in this enclosure:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.

   The list of physical drives appears in Management View.

Identifying a Physical Drive

To identify physical drive in the VessRAID subsystem enclosure:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. In Management View, click the physical drives in the graphic.

   The location of the physical drive is highlighted in the Enclosure Front View diagram.

Making Global Physical Drive Settings

Global settings apply to all of the physical disk drives installed in the VessRAID subsystem enclosure. To make global physical drive settings:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click the **Global Settings** tab in Management View.
6. Make the settings as needed.

   For SATA drives, check the boxes to enable:

   - Write Cache
   - Read Look Ahead Cache
   - Command Queuing (for disk drives that support Command Queuing)
   - From the DMA Mode dropdown menu, choose a DMA mode.

   For SAS drives, check the boxes to enable:

   - Write Cache
   - Read Look Ahead Cache
   - Command Queuing (for disk drives that support Command Queuing)
   - Read Cache
7. Click the **Submit** button.

   The functions you enable here depend on whether the physical drives support those functions. See “Viewing Physical Drive Information” on page 97 to determine which functions a particular drive supports.

Viewing Physical Drive Information

To view physical drive information:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click a Physical Drive icon.

Useful information provided here includes:

- The location of the physical drive is highlighted in the Enclosure Front View diagram.

- **Operational Status** – OK is normal. Can also show Rebuilding, Forced Online, Forced Offline, Transition Running, PDM Running, Media Patrol Running, Stale, PFA, Offline, or Dead.
- **Configuration Status** – The array to which the drive is assigned or its spare designation, including Unconfigured, Stale, PFA, Global Spare, Dedicated Spare, Revertible Global Spare, Revertible Dedicated Spare.

Adjustable Items

- Write Cache
- Read Look Ahead Cache
- Read Cache (SAS drive only)
- Command Queuing
- DMA Mode (SATA drives only)

See “Making Global Physical Drive Settings” on page 97.

Viewing Physical Drive Statistics

To view physical drive statistics:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click a Physical Drive icon.
6. From the dropdown menu on the Information tab, choose *Statistics*.

Clearing Statistics

To clear statistics, see “Clearing Statistics” on page 81.

Making Physical Drive Settings

An alias is the only setting you can make to an individual physical drive. All other settings are global. See “Making Global Physical Drive Settings” on page 97.

To make physical drive settings:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click a Physical Drive icon.

6. Click the **Settings** tab in Management View.
7. Type an alias into the Physical Drive Alias field.

   Maximum of 32 characters. Use letters, numbers, space between words, and underscore. An alias is optional.
8. Click the **Submit** button.

Clearing Stale and PFA Conditions

The Clear tab only appears when those conditions are present.

- **Stale** – The physical drive contains obsolete disk array information.
- **PFA** – The physical drive has errors resulting in a prediction of failure.

Be sure you have corrected the condition by a physical drive replacement, rebuild operation, etc., first. Then clear the condition. See “Physical Drive Problems” on page 294 for more information.

To clear a Stale or PFA status from a physical drive:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click a Physical Drive icon.
6. In Management View, click the **Clear** tab.
7. In the Confirmation box, click **OK** to confirm.

Note

If a physical drive has both a Stale and a PFA condition, click the **Clear** tab once to clear the Stale condition, then click again to clear the PFA condition.

Forcing a Physical Drive Offline or Online

The Physical Drive–Force Offline/Online tab enables you to force an:

- Online physical drive to go Offline
- Offline physical drive to go Online

The Force Offline/Online tab appears only for physical drives that are assigned to disk arrays.

Caution

Forcing a physical drive offline or online is likely to cause data loss. Back up your data before you proceed. Use these functions only when required.

Important

Forcing a physical drive offline will cause your logical drives to become degraded. If Auto Rebuild is enabled and a spare drive is available, the disk array will begin rebuilding itself automatically.

To force a physical drive offline or online:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click a Physical Drive icon.
6. Click the **Force Offline/Online** tab in Management View.
7. Click the **Submit** button.
8. In the confirmation box, type the word **confirm** in the field provided.
9. Click the **OK** button.

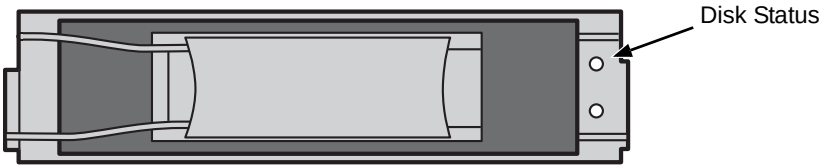
Locating a Physical Drive

To locate a physical drive:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click a Physical Drive icon.

6. Click the physical drive you want to locate on the WebPAM PROe screen. The disk status LED for the physical drive blinks for one minute.

Figure 8. Disk Status LED



Managing UPS Units

Uninterruptible Power Supply (UPS) Management includes the following functions:

- Viewing a List of UPS Units (below)
- Making UPS Settings (page 103)
- Viewing UPS Information (page 104)

Viewing a List of UPS Units

To view a list of UPS units supporting the VessRAID:

1. Click the Subsystem icon in Tree View.
2. Click the UPS icon.
3. Click the **Information** tab in Management View.

   Information in the UPS List includes:

   - UPS ID – Click the ID number to view the UPS Tab.
   - Operational Status – OK means Normal.

     On AC means the UPS is connected to a viable external AC power source.

     On Battery means the external AC power source is offline and the UPS is running on battery power.
   - Model Name or Number
   - Battery Capacity – Backup capacity expressed as a percentage.
   - Loading Ratio – Actual output of UPS as a percentage of the rated output. See the Note below.
   - Remaining Backup Time – Number of minutes the UPS is expected to power your system in the event of a power failure.

Note

The maximum recommended Loading Ratio varies among models of UPS units. The general range is 60% to 80%. If the reported Loading Ratio exceeds the recommended value for your UPS unit:

- Have fewer subsystems or peripherals connected to this UPS unit.
- Add more UPS units, or use a higher-capacity UPS unit, to protect your RAID systems.

Making UPS Settings

These settings control how the VessRAID subsystem detects the UPS unit and responds to data reported by the UPS unit.

To make UPS settings:

1. Click the Subsystem icon in Tree View.
2. Click the UPS icon.
3. Click the **Settings** tab in Management View.
4. Perform the following actions as required:
   - Verify the Current UPS Communication method:
     - USB – USB connection.
     - Unknown – No connection.
   - Choose a Detection Setting from the dropdown menu:
     - Automatic – Default. If a UPS is detected when the subsystem boots, the setting changes to Enable.
     - Enable – Monitors UPS. Settings changes, reports warnings, and logs events.
     - Disable – Monitors UPS only.
   - Choose an Action Mode from the dropdown menu:
     - ShutDown – Shuts down the subsystem when a Threshold value is exceeded.
     - None – No additional action when Threshold value is exceeded.
   - Type values into the Threshold fields. See Note 1:
     - Running Time Remaining Threshold – Actual time below this value resets adaptive writeback cache to writethrough.
     - Warning Temperature Threshold – Actual temperature above this value triggers a warning and logs an event.
     - Loading Ratio Threshold – Actual loading ratio (percentage) above this threshold triggers a warning and logs an event. See Note 2.
     - Battery Charge Remaining Threshold – Reserve capacity below this percentage triggers a warning and logs an event.
5. Click the **Submit** button to apply your settings.

Notes

1. Detection Setting must be set to Auto. If a UPS is detected, the setting changes to Enable.
2. The maximum recommended Loading Ratio varies among models of UPS units. The general range is 60% to 80%.

Viewing UPS Information

To view information about a specific UPS unit:

1. Click the Subsystem icon in Tree View.
2. Click the UPS icon.
3. Click the UPS1 or UPS2 icon.
4. Click the **UPS** tab in Management View.

   UPS information includes:

   - Voltage Rating – Output voltage of the UPS.
   - Battery Capacity – Backup capacity expressed as a percentage.
   - Remaining Backup Time – Number of minutes the UPS is expected to power your system in the event of a power failure.
   - Loading Ratio – Actual output of UPS as a percentage of the rated output. See the Note below.

Note

The maximum recommended Loading Ratio varies among models of UPS units. The general range is 60% to 80%. If the reported Loading Ratio exceeds the recommended value for your UPS unit:

- Have fewer subsystems or peripherals connected to this UPS unit.
- Add more UPS units, or use a higher-capacity UPS unit, to protect your RAID systems.

Managing Disk Arrays

Disk Array Management includes the following functions:

- Viewing Disk Arrays (page 105)
- Creating a Disk Array (page 105)
- Deleting a Disk Array (page 110)
- Viewing Disk Array Information (page 110)
- Making Disk Array Settings (page 111)
- Creating a Logical Drive (page 112)
- Deleting a Logical Drive (page 113)
- Migrating a Disk Array (page 113)
- Rebuilding a Disk Array (page 114)
- Running PDM on a Disk Array (page 116)
- Transitioning a Disk Array (page 116)
- Preparing a Disk Array for Transport (page 117)

Viewing Disk Arrays

To view the disk arrays in this enclosure plus any expanded or cascaded enclosures:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.

   A list of disk arrays appears in Management View.

   Click the **DA** link to view a specific disk array. See “Viewing Disk Array Information” on page 110.

Creating a Disk Array

The CLU provides three methods of creating a disk array:

- **Automatic** – Creates a new disk array following a default set of parameters. Makes one logical drive automatically. Also makes a hot spare drive for all RAID levels except RAID 0, if at least five unconfigured physical drives are available. If you have multiple enclosures, multiple disk array and logical drive sets are created. See “Creating a Disk Array – Automatic” on page 106.
- **Express** – You choose the parameters for a new disk array by specifying the characteristics you want. You can create multiple logical drives at the same time, however they will all be identical. You can choose to make a hot spare drive for all RAID levels except RAID 0, if at least five unconfigured physical drives are available. See “Creating a Disk Array – Express” on page 107.

- **Advanced** – You directly specify all parameters for a new disk array. Makes one logical drive automatically. You can create additional logical drives at a later time, if additional configurable capacity is available. Does not make a hot spare drive. See “Creating a Disk Array – Advanced” on page 108.

Creating a Disk Array – Automatic

The Disk Array Automatic Creation option enables you to create a new disk array following a default set of parameters. One logical drive will be made automatically when you create the disk array.

If you have multiple enclosures, a separate disk array and logical drive set will be created for each enclosure.

If you have both Hard Disk Drives (HDD) and Solid State Drives (SSD), separate disk array and logical drive sets will be created for your HDDs and for your SSDs. These two drive types cannot be mixed in the same disk array.

To create a Disk Array using the Automatic function:

To create a disk array automatically:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the **Create** tab in Management View.
4. From the Create tab dropdown menu, choose *Automatic*.

   The following parameters display:

   - **Disk Arrays** – The number of physical drives in the disk array, their slot numbers, configurable capacity, and the number of logical drives to be created
   - **Logical Drives** – The ID number of the logical drive(s), their RAID level, capacity, and stripe size
   - **Spare Drives** – The physical drive slot number of the dedicated hot spare assigned to this disk array. A hot spare drive is created for all RAID levels except RAID 0, when five or more unconfigured physical drives are available
5. If you accept these parameters, click the **Submit** button.

   The new disk array appears in the Disk Array List the Information tab.

   If you do NOT accept these parameters, use the Advanced option to create your disk array.

Creating a Disk Array – Express

The Disk Array Express Creation option enables you to choose the parameters for a new disk array by specifying the characteristics you want. With this method, you can create multiple logical drives at the same time you create your disk array. However, all of the logical drives will be the same.

If you prefer to specific the parameters directly, use the Advanced option to create your disk array.

If you are uncertain about choosing parameters for your disk array, use the Automatic option.

If you have both Hard Disk Drives (HDD) and Solid State Drives (SSD), separate disk arrays will be created for your HDDs and for your SSDs. Each array will have the number of logical drives that you specified.

To create a new disk array:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the **Create** tab in Management View.
4. From the Create tab dropdown menu, choose *Express*.
5. Check the boxes to choose any one or combination of:
   - **Redundancy** – The array will remain available if a physical drive fails
   - **Capacity** – The greatest possible amount of data capacity
   - **Performance** – The highest possible read/write speed
   - **Mixing SATA/SAS Drive** – Check this box if you want to use both SATA and SAS drives in the same disk array

     If the box is unchecked, and you have both SATA and SAS drives, different arrays will be created for each type of drive.
6. In the Number of Logical Drives field, enter the number of logical drives you want to make from this disk array.
7. From the Application Type menu, choose an application that best describes your intended use for this disk array:
   - File Server
   - Video Stream
   - Transaction Data
   - Transaction Log
   - Other
8. Click the **Update** button.

   Or check the Automatic Update box and updates will occur automatically.

The following parameters display:

- **Disk Arrays** – The number of physical drives in the disk array, their slot numbers, configurable capacity, and the number of logical drives to be created
- **Logical Drives** – The slot number of the logical drive(s), their RAID level, capacity, and stripe size
- **Spare Drives** – The physical drive slot number of the dedicated hot spare assigned to this disk array (all RAID levels except RAID 0)

If you have both Hard Disk Drives (HDD) and Solid State Drives (SSD), separate disk arrays will be created for your HDDs and for your SSDs. Each array will have the number of logical drives that you specified.

If you accept these parameters, proceed to the next step. If NOT, review and modify your selections in the previous steps.

9. When you are done, click the **Submit** button.

The new disk array appears in the Disk Array List the Information tab.

Creating a Disk Array – Advanced

The Disk Array Advanced Creation option enables you to directly specify all parameters for a new disk array. One logical drive will be made automatically when you create the disk array. If you choose less than the total available capacity, you can use the remaining space to create additional logical drives at a later time.

If you are uncertain about choosing parameters for your disk array, use the Express or Automatic option to create your disk array.

To create a new disk array:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. From the Create tab dropdown menu, choose *Advanced*.

Step 1 – Disk Array Creation

1. Enter an alias for the disk array in the field provided.
2. Check the boxes to enable the following features.
   - **Media Patrol** – A routine maintenance procedure that checks the magnetic media on each disk drive. Media Patrol is concerned with the condition of the media itself, not the data recorded on the media.
   - **PDM** – Predictive Data Migration (PDM) scans the bad sector remapping table of the disk drives assigned to a logical drive. When the table fills to a specified percentage of its capacity, PDM triggers a

migration of data from the suspect drive (the disk drive with the bad sectors) to a spare disk drive.

3. From the Media Type dropdown menu, choose the physical drive type to use in the array.
   - **HDD** – Hard Disk Drives
   - **SSD** – Solid State Drives

   The drive type you selected appears in the list of Physical Drives. You cannot mix HDDs and SSDs in the same disk array.
4. Highlight the physical drives you want in the disk array from the Available list and press the **>>** button to move them to the Selected list.

   You can also double-click them to move them.
5. When you are done, click the **Next** button.

Step 2 – Logical Drive Creation

1. Optional. Enter an Alias (name) for the first logical drive.
2. Choose a RAID level for the logical drive from the dropdown menu.

   The choice of RAID levels depends on the number of physical drives you selected.
3. RAID 50 and 60 only. Choose the number of axles from the dropdown menu.
4. Specify a Capacity and the unit of measure (MB, GB, or TB).

   This value will be the data capacity of the logical drive. If you specify less than disk array's maximum capacity, the remainder is available for additional logical drives.
5. Specify a Stripe size from the dropdown menu.

   64, 128, 256, 512 KB, and 1 MB are available. 64 KB is the default.
6. Specify a Sector size from the dropdown menu.

   512 Bytes, 1, 2, and 4 KB are available. 512 Bytes is the default.
7. Choose a Read Cache policy:

   Read Cache, *Read Ahead Cache*, and *No Cache* are available. Read Ahead is the default.
8. Choose a Write Cache policy:

   Write Back and *Write Through* are available. Write Back is the default.
9. From the Initialization dropdown menu, choose an Initialization policy.

   None, *Quick*, and *Full* are available. None is the default but is not recommended.
10. Click the **Update** button.

    A new logical drive is displayed under New Logical Drives.

    Repeat the above steps to specify additional logical drives as desired.

11. When you have finished specifying logical drives, click the **Next** button.

Step 3 – Summary

The Summary lists the disk array and logical drive information you specified.

To proceed with disk array and logical drive creation, click the **Submit** button.

Note

This function does not automatically create a hot spare drive. After the disk array is created, you can create a hot spare drive for it. For more information, see “Creating a Spare Drive” on page 125.

Deleting a Disk Array

The Disk Arrays–Delete tab enables you to delete existing disk arrays.

Caution

If you delete a disk array, you also delete any logical drives that belong to it, along with the data in those logical drives. Back up any important data before deleting a disk array.

To delete a disk array:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the **Delete** tab in Management View.
4. Check the box to the left of the disk array you want to delete.
5. Click the **Submit** button.
6. In the confirmation box, type the word confirm in the field provided.
7. Click the **OK** button.

The selected disk array disappears from the Disk Array List the Information tab.

Viewing Disk Array Information

To view Disk Array information:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
   The disk array information is shown in Management View.

Disk Array Operational Status

- **OK** – The normal state of a disk array. For RAID Levels other than RAID 0 (Striping), the disk array has full redundancy.
- **Synchronizing** – When you first create a disk array, the disk array synchronizes. During that time, your data is available. However, access will be slower until synchronizing is done.
- **Critical/Degraded** – This condition results from a physical drive failure. Your data is still available. However, the disk array has lost redundancy (fault tolerance). You must determine the cause of the problem and correct it. See “Critical & Offline Disk Arrays” on page 290.
- **Rebuilding** – This condition is temporary. When a physical drive has been replaced, the disk array automatically begins rebuilding in order to restore redundancy (fault tolerance). Your data is still available. However, access will be slower until rebuilding is done.
- **Transport Ready** – The result of a successful Prepare for Transport operation. You remove the physical drives of this disk array and move them to another enclosure or to different drive slots in the same enclosure. After you relocate the physical drives, the disk array status will show OK.

Adjustable Items

- **Alias** – Optional.
- **Media Patrol** – Enabled or disabled.
- **PDM** – Enabled or disabled.

See “Making Disk Array Settings” below.

Making Disk Array Settings

To make Disk Array settings:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the **Settings** tab in Management View.
5. Optional. Enter an alias in the Disk Array Alias field.

   Maximum of 32 characters. Use letters, numbers, space between words, and underscore. An alias is optional.
6. To enable Media Patrol support, check the **Media Patrol** box.
7. To enable PDM support, check the **PDM** box.
8. Click the **Submit** button.

Creating a Logical Drive

When you create a disk array, you automatically create one logical drive also. If the initial logical drive used less than the full capacity of the disk array, you can create additional logical drives from the same disk array.

To create a logical drive:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the **Create LD** tab in Management View.
5. Enter an alias (name) in the Alias field.

   Maximum of 32 characters. Use letters, numbers, space between words, and underscore. An alias is optional.
6. From the RAID Level dropdown list, choose a RAID level for this logical drive.

   All RAID levels supported by the disk array appear in the list. See “Choosing a RAID Level” on page 244.
7. RAID 50 and 60 only – Specify the number of axles for your array.

   For more information on axles, see “RAID 50 Axles” on page 241 or “RAID 60 Axles” on page 243.
8. Enter a capacity and choose unit of measure (MB, GB, TB).

   The default value is the available capacity of the disk array. You can use this value or any lesser amount.
9. From the Stripe dropdown menu, choose a Stripe size for this logical drive.

   The choices are 64 KB, 128 KB, 256 KB, 512 KB, and 1 MB. 64 KB is the default. See “Choosing Stripe Size” on page 247.
10. From the Sector dropdown menu, choose a Sector size for this logical drive.

    The choices are 512 B, 1 KB, 2 KB, and 4 KB. 512 B is the default. See “Choosing Sector Size” on page 247.
11. From the Read Policy dropdown menu, choose a Read Cache policy for this logical drive.

    The choices are Read Cache, Read Ahead, and No (read) Cache. Read Ahead is the default. See “Cache Policy” on page 248.
12. From the Write Policy dropdown menu, choose a Write Cache policy for this logical drive.

    The choices are Write Through (thru) and Write Back. Write Back is the default. If you selected No Cache under Read Cache, this setting will be Write Through. See “Cache Policy” on page 248.

13. Click the **Update** button to enter the logical drive parameters.
14. Review the results. If there is remaining space the disk array, you can create another logical drive, following the steps above. Each logical drive can have a different set of parameters.
15. Click the **Next** button when you are done.

    A new window displays with the disk array information and the proposed logical drives with their parameters.
16. Click the **Submit** button create the logical drives.

The new logical drive appears in the Logical Drive List the Information tab.

If you created a fault-tolerant logical drive (any RAID level except RAID 0), the Operational Status of new logical drive will display *Synchronizing* for several minutes after creation. You can use the logical drive during this period but read/write performance could be slower than normal.

Deleting a Logical Drive

Caution

All data the logical drive will be lost. Back up any valuable data before deleting the logical drive.

To delete a logical drive:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the **Delete LD** tab in Management View.
5. Check the box to the left of the logical drive you want to delete.
6. Click the **Submit** button.

   In the confirmation box, type the word **confirm** in the field provided.
7. Click the **OK** button.

The selected logical disappears from the Logical Drive List the Information tab.

Migrating a Disk Array

The action of migrating a disk array means either or both:

- Change the RAID Level
- Expand the storage capacity

For a list of Migration options and other important information, see “RAID Level Migration” on page 252.

Notes

- You can add physical drives to a RAID 50 or RAID 60 array but you cannot change the number of axles.
- If you add an odd number of physical drives to a RAID 10 array, it will become a RAID 1E array by default.

To Migrate an existing disk array:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. From the dropdown menu the Background Activities tab, choose *Start Migration*.
5. Highlight physical drives you want in the disk array from the Available list and press the >> button to move them to the Selected list.

   You can also double-click them to move them.

   The available drives are either HDD or SSD, depending on the type of drives in the array.
6. When you are done, click the **Next** button.
7. Select a new RAID Level, if desired.
8. To expand the disk array's capacity, check the Expand Capacity box.
9. If you checked the Expand Capacity box, enter a number into the Capacity field and choose the appropriate unit of measure (MB, GB, TB).
10. Under Capacity Usage, highlight the logical drive whose RAID level you want to change or whose capacity you want to expand.
11. Click the **Update** button.

    The logical drive changes to reflect your choices.
12. Update other logical drives using the same method.
13. When you are done making the changes, click the **Next** button.
14. Click the **Submit** button to begin Migration.

To set Migration priority, see “Making Background Activity Settings” on page 54.

Rebuilding a Disk Array

When you rebuild a disk array, you are actually rebuilding the data on a replacement physical drive.

Rebuilding Automatically

Normally, a disk array would rebuild itself using a hot disk drive, after going Critical. However, if the Auto Rebuild function is disabled or no spare drives are available, you must initiate the procedure.

To enable Auto Rebuild, see “Making Background Activity Settings” on page 54.

To create a spare drive, see “Creating a Spare Drive” on page 125.

For more information, see “Hot Spare Drive(s)” on page 251.

Rebuilding Manually

If a physical drive has failed, identify and replace the drive, then rebuild the disk array as described below:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.

   If there are multiple disk arrays, choose the icon with the yellow !.
4. From the dropdown menu the Background Activity tab, choose *Start Rebuild*.
5. Select the Source physical drive.

   This is a remaining functional physical drive in the disk array.
6. Select the Target physical drive.

   This is the replacement physical drive. The available drives are either HDD or SSD, depending on the type of drives in the array.
7. Click the **Submit** button.

The Disk Array Background Activity tab shows the rebuild progress on the replacement (target) physical drive. Depending the size of the physical disk involved, this process will take some time.

To view more information, click the **Rebuild on PDx** link.

To set Rebuild priority, see “Making Background Activity Settings” on page 54.

Running Media Patrol on a Disk Array

Media Patrol checks the magnetic media on physical drives. When it finds the specified number of bad blocks, it will trigger PDM. See “Making Background Activity Settings” on page 54 and “Running PDM” on page 56.

You can schedule Media Patrol to run automatically, see “Scheduling an Activity” on page 56.

To start Media Patrol:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. From the dropdown menu the Background Activities tab, choose *Start Media Patrol*.
5. Click the **Start** button.

Running PDM on a Disk Array

Predictive Data Migration (PDM) migrates data from the suspect physical drive to a spare physical drive, similar to Rebuilding. But unlike Rebuilding, PDM acts *before* the disk drive fails and your Logical Drive goes Critical.

See “Predictive Data Migration (PDM)” on page 260.

To start PDM:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the **Background Activities** tab in Management View.
5. From the dropdown menu the Background Activities tab, choose *Start PDM*.
6. In the next screen, choose the Source and Target physical drives.

   The suspect physical drive is the source.

   The replacement physical drive is the target. The available drives are either HDD or SSD, depending on the type of drives in the array.
7. Click the **Start** button.

Transitioning a Disk Array

Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare. The revertible spare drive returns to its original status. For more information, see “Transition” on page 261.

In order to run the Transition function:

- The spare drive must be Revertible.
- You must have an unconfigured physical drive of the same or larger capacity, and the same type, HDD or SSD, to replace the spare drive.

To run Transition:

1. Click the Subsystem icon in Tree View.
2. From the dropdown menu on the Background Activities tab, choose *Start Transition*.
3. Choose an unconfigured physical drive from the list of available drives.
4. From the Target Physical Drive dropdown menu, choose an unconfigured physical drive.

   The available drives are either HDD or SSD, depending on the type of drives in the array.
5. Click the **Submit** button.

After Transition is completed, refresh the screen. The revertible spare drive is listed under the Spare Drives icon and the disk array's status shows OK.

To set Transition priority, see "Making Background Activity Settings" on page 54.

Preparing a Disk Array for Transport

Transport is the action of moving the physical drives of a disk array:

- To different slots in the same VessRAID enclosure
- From one VessRAID enclosure to another

Important

Before you can use this feature, the disk array's Operational Status must be OK.

To prepare a disk array for transport:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the **Transport** tab in Management View.
5. Click the **Submit** button.
6. In the confirmation box, type the word **confirm** in the field provided.
7. Click the **OK** button.
8. After the Transition is complete, move the physical drives comprising the disk array to their new locations.
9. Click the **Refresh** button in your Browser.

   The drives appear in their new locations and disk array status displays OK.

Managing Logical Drives

Logical drives are made from disk arrays. In the Tree, you can see a graphic representation of the logical drives that belong to each array. You can see a summary of all logical drives in the subsystem under Logical Drive Summary.

Logical drive management includes the following functions:

- Viewing Information for All Logical Drives (below)
- Viewing Logical Drive Information (page 119)
- Viewing Logical Drive Statistics (page 120)
- Making Logical Drive Settings (page 120)
- Initializing a Logical Drive (page 120)
- Running Redundancy Check (page 121)
- Viewing the Logical Drive Check Table (page 122)
- Making Logical Drive LUN Settings (page 123)

Viewing Information for All Logical Drives

To view information about all logical drives in a disk array:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon

Logical Drive Status

- **OK** – The normal state of a logical drive. For RAID Levels other than RAID 0 (Striping), the logical drive has full redundancy.
- **Synchronizing** – When you first create a logical drive, the logical drive synchronizes. During that time, your data is available. However, access will be slower until synchronizing is done.
- **Rebuilding** – This condition is temporary. When a physical drive has been replaced, the logical drive automatically begins rebuilding in order to restore redundancy (fault tolerance). Your data is still available. However, access will be slower until rebuilding is done.
- **Critical** – This condition results from a physical drive failure. Your data is still available. However, the logical drive has lost redundancy (fault tolerance). You must determine the cause of the problem and correct it. See “Critical & Offline Disk Arrays” on page 290.
- **Offline** – This condition arises as the result of a second physical drive failure. An Offline logical drive is not accessible but some or all of your data

may remain intact. You must determine the cause of the problem and correct it. “Critical & Offline Disk Arrays” on page 290

- **Transport Ready** – The result of a successful Prepare for Transport operation. You remove the physical drives of this logical drive and move them to another enclosure or to different drive slots in the same enclosure. After you relocate the physical drives, the logical drive status will show OK.

To create a logical drive, see “Creating a Logical Drive” on page 112.

To delete a logical drive, see “Deleting a Logical Drive” on page 113.

For a Degraded or Offline logical drive, see “Critical & Offline Disk Arrays” on page 290.

Viewing Logical Drive Information

To view information for a single logical drive:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon
5. Click the Logical Drive icon.

To specify an Alias or set the Read and Write Policies, click the **Settings** tab.

Logical Drive Status

See “Logical Drive Status” on page 118.

Logical Drive Synchronization

Synchronization is an automatic procedure applied to logical drives when they are created. Yes means the logical drive was synchronized.

Adjustable Items

- Alias (optional)
- Read Policy
- Write Policy
- Preferred Controller ID

See “Making Logical Drive Settings” on page 120.

Viewing Logical Drive Statistics

To view information for a single logical drive:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon
5. Click the Logical Drive icon.
6. In Management View, from the dropdown menu on the Information tab, choose *Statistics*.

Clearing Statistics

To clear statistics, see “Clearing Statistics” on page 81.

Making Logical Drive Settings

To make Logical Drive settings:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon
5. Click the Logical Drive icon.
6. Click the **Settings** tab in Management View.
7. Optional. Enter an alias in the Logical Drive Alias field.

   Maximum of 32 characters. Use letters, numbers, space between words, and underscore. An alias is optional.
8. From the Read Policy dropdown menu, choose a Read Cache policy.

   The choices are Read Cache, Read Ahead, and No Cache.
9. From the Write Policy dropdown menu, choose a Write Cache policy.

   The choices are Write Back and Write Through (Thru). If you choose No Read Cache, Write policy is automatically Write Through.
10. Click the **Submit** button.

Initializing a Logical Drive

Initialization is done to logical drives after they are created from a disk array. Initialization sets all data bits in the logical drive to zero. The action is useful

because there may be residual data the logical drives left behind from earlier configurations. For this reason, Initialization is recommended for all new logical drives.

Caution

When you initialize a logical drive, all the data the logical drive will be lost. Backup any important data before you initialize a logical drive.

Initialize a Logical Drive:

1. Click the Subsystem icon in Tree View.
2. Click the Logical Drive Summary icon.
3. Click the icon of the logical drive you want to Initialize.

   You can also start Initialization from the Subsystem icon Background Activities tab
4. Click the **Background Activities** tab in Management View.
5. From the Background Activities dropdown menu, choose *Initialization*.
6. To choose Quick Initialization, check the box.

   If you checked the box, enter a value in the Quick Initialization Size field. This value is the size of the initialization blocks in MB.
7. If you did not choose Quick Initialization, enter a hexidecimal value in the Initialization Pattern in Hex field or use the default 00000000 value.
8. Click the **Submit** button.
9. In the confirmation box, type the word **confirm** in the field provided.
10. Click the **OK** button.

To view the progress of the Initialization, click the **Background Activity** tab.

To set Initialization priority, see “Making Background Activity Settings” on page 54.

Running Redundancy Check

Redundancy Check is a routine maintenance procedure for fault-tolerant logical drives (those with redundancy) that ensures all the data matches exactly. Redundancy Check can also correct inconsistencies. You can also schedule a Redundancy Check. See “Scheduling an Activity” on page 56.

Redundancy Check a Logical Drive:

1. Click the Subsystem icon in Tree View.
2. Click the Logical Drive Summary icon.

3. Click the icon of the logical drive you want to Initialize.

   You can also start Redundancy check from the Subsystem icon Background Activities tab

4. From the dropdown menu on the Background Activities tab, choose *Redundancy Check*.
5. To choose *Auto Fix*, check the box.

   This feature attempts to repair the problem when it finds an error.

6. To choose *Pause On Error*, check the box.

   This feature stops the process when it finds an error.

   If Auto Fix is also checked, the process stops only when it finds a non-repairable error.

7. Click the **Submit** button.

To view the progress of the Redundancy Check, click the **Background Activity** tab.

To set Redundancy Check priority, see “Making Background Activity Settings” on page 54.

Viewing the Logical Drive Check Table

The Logical Drive Check Table displays errors related to a logical drive. Use this information to evaluate the integrity of the logical drive and to determine whether corrective action is needed. To View the tables:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon
5. Click the Logical Drive icon.
6. Click the **Check Table** tab in Management View.
7. Click the option for the table you want to see.

   The default is All tables.

   If there are entries, they are listed as follows:

   - **Entry Number** – A number assigned to each block of entry.
   - **Table Type** – Read Check, Write Check or Inconsistent Block (see below).
   - **Start Logical Block Address** – LBA of the first block for this entry.
   - **Count** – Number of continuous blocks starting from this LBA.

Table Definitions

- **Read Check Table** – Contains a list of read errors for this logical drive.
- **Write Check Table** – Contains a list of write errors for this logical drive.
- **Inconsistent Block Table** – Contains a list of inconsistent blocks for this logical drive. Mirror data for RAID Levels 1, 1E, and 10 or Parity data for RAID Levels 5, 6, 50, and 60 identified by the Redundancy Check (a background function).

Making Logical Drive LUN Settings

LUN Masking is the process of applying a LUN Map so that each initiator can only access the LUNs specified for it.

Before you can specify an initiator for your LUN map, you must add the initiator to the VessRAID 's initiator list. See “Adding an Initiator” on page 68.

You must enable LUN Masking in order apply a LUN map. See “Enabling LUN Masking” on page 69.

To specify a LUN Map:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon
5. Click the Logical Drive icon.
6. Click the **LUN Map** tab in Management View.
7. From the Unassigned Initiator List, click an initiator to choose it.
   Or type the initiator name into the Initiator Name field.
8. Type a LUN into the Map to LUN field.
9. Click the **Assign** button.
   The initiator appears in the Assigned Initiator List.
10. Click the **Submit** button.

Notes

- Obtain the initiator name from the initiator utility on your host system.
- The initiator name you input must match exactly in order for the connection to work.

Managing Spare Drives

When a physical drive in a disk array fails and a spare drive of adequate capacity is available, the disk array will begin to rebuild automatically using the spare drive. See “Critical & Offline Disk Arrays” on page 290.

Spare drive management includes the following functions:

- Viewing a List of Spare Drives (page 124)
- Locating a Spare Drive (page 124)
- Creating a Spare Drive (page 125)
- Deleting Spare Drive (page 126)
- Making Spare Drive Settings (page 126)
- Running Spare Check (page 127)

Viewing a List of Spare Drives

To view a list of spare drives:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.

The information includes:

- **ID** – The unique ID number assigned to the spare drive.
- **Operational Status** – OK is normal. Can also show Rebuilding, Transition Running, PDM Running, or Offline.
- **Physical Drive ID** – The ID number of the physical drive in the subsystem enclosure.
- **Capacity** – The data storage capacity of this spare drive.
- **Revertible** – Yes or No. A revertible spare drive automatically returns to its spare drive assignment after the failed physical drive in the disk array is replaced.
- **Type** – Global, can be used by any disk array. Dedicated, can only be used by the assigned disk array.
- **Dedicated to Array** – For dedicated spares, the disk array to which it is assigned. Global spares show N/A.

Locating a Spare Drive

To locate a physical drive assigned as a spare drive in the VessRAID subsystem enclosure:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.

3. Click the Spare Drive icon.

   In Management View, the Enclosure Front View diagram appears with the location of the spare drive highlighted.

Creating a Spare Drive

Important

- There must be an unconfigured physical drive available for selection as a spare drive. See “Viewing a List of Physical Drives” on page 96.
- Be sure the unconfigured physical drive has adequate capacity to replace the largest drive in the disk array.

To create a spare drive:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.
3. Click the **Create** tab in Management View.
4. Choose a spare type, *Global* or *Dedicated*.

   Global can be used by any disk array. Dedicated can only be used by the assigned disk arrays
5. Click the **Next** button.
6. To make a revertible spare drive, check the **Revertible** box.

   A revertible spare drive can be returned to spare drive status after it replaces a failed drive in a disk array. See “Transition” on page 261 for more information.
7. To enable Media Patrol on this spare drive, check the Enable Media Patrol box.
8. Dedicated spares only. From the Media Type dropdown menu, choose the physical drive type used in the array.
   - **HDD** – Hard Disk Drives
   - **SSD** – Solid State Drives

   The drive type you selected appears in the list of Physical Drives. You cannot mix HDDs and SSDs in the same disk array.
9. In the Physical drives field, highlight the physical drive you want to assign as a spare drive in the Available list and press the **>>** button to move the drive to the Selected list.

   You can also double-click drives to move them.

10. If you selected a Dedicated spare drive, in the Dedicated to Disk Arrays field, highlight disk arrays to which you want assign the spare drive from the Available list and press the **>>** button to move the array to the Selected list.

    You can also double-click arrays to move them.

11. Click the **Update** button.

    Your choices are displayed under New Hot Spare Drives.

12. If you agree with the proposed choices, click the **Submit** button.

Deleting Spare Drive

Note

If an existing spare drive has the wrong parameters for your needs, click the **Settings** tab to change the parameters rather than delete the spare drive and create a new one.

To delete a spare drive:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.
3. Click the **Delete** tab in Management View.
4. Check the box to the left of the spare drive you want to delete.
5. Click the **Submit** button.

   In the confirmation box, type the word **confirm** in the field provided.

6. Click the **OK** button.

Making Spare Drive Settings

The Spare Drive–Settings tab enables you to change the settings of an existing spare drive. To change spare drive settings:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.
3. Click the Spare Drive icon.
4. Click the **Settings** tab in Management View.
5. Choose a spare type, *Global* or *Dedicated*.

   Global can be used by any disk array. Dedicated can only be used by the assigned disk arrays

6. To make a revertible spare drive, check the Revertible box.

   A revertible spare drive automatically returns to its spare drive assignment after the failed physical drive in the disk array is replaced.

7. If you selected a Dedicated spare drive, in the Dedicated to Disk Arrays field, highlight the disk arrays to which you want assign the spare drive from the Available list and press the **>>** button to move them to the Selected list.

   You can also double-click array to move it.

8. Click the **Submit** button.

Running Spare Check

Spare Check verifies the operational status of your spare drives. You can also schedule a Spare Check. See “Scheduling an Activity” on page 56.

To check a spare drive:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.
3. Click the **Spare Check** tab in Management View.
4. From the Physical Drive dropdown menu, choose the spare drive you want to check.

   Or choose *All* to check all the spare drives at the same time.

5. Click the **Submit** button.

The results of the Spare Check appear under Spare Check Status in the Information tab. “Healthy” means normal condition.

Working with the Logical Drive Summary

The Logical Drive Summary displays a list of all logical drives in the VessRAID enclosure plus the expanded or cascaded enclosures. This list does not arrange the logical drives under the disk array to which they belong nor under the enclosure in which they are located.

Logical Drive Summary includes the following functions:

- Viewing a List of All Logical Drives (page 128)
- Viewing Individual Logical Drive Information (page 128)

Viewing a List of All Logical Drives

To view a list of all logical drives in all enclosures:

1. Click the Subsystem icon in Tree View.
2. Click the Drive Summary icon.

Viewing Individual Logical Drive Information

1. Click the Subsystem icon in Tree View.
2. Click the Drive Summary icon.
3. Click the Logical Drive icon.

   The information and location for the logical drive appear in Management View. See Viewing Logical Drive Information (page 119).

Chapter 5: Management with the CLU

This chapter covers the following topics:

- Initial Connection (page 130)
- Running Quick Setup (page 134)
- Managing the Subsystem (page 135)
- Managing the Controller (page 137)
- Managing the Enclosure (page 140)
- Managing Physical Drives (page 145)
- Managing Disk Arrays (page 148)
- Managing Spare Drives (page 159)
- Managing Logical Drives (page 162)
- Managing the Network Connection (page 165)
- Managing SAS Connections (page 166)
- Managing Background Activity (page 168)
- Working with the Event Viewer (page 170)
- Working with LUN Mapping (page 172)
- Managing UPS Units (page 174)
- Managing Users (page 177)
- Working with Software Management (page 180)
- Flashing through TFTP (page 186)
- Viewing Flash Image Information (page 186)
- Clearing Statistics (page 186)
- Restoring Factory Defaults (page 187)
- Shutting Down the Subsystem (page 188)
- Restarting the Subsystem (page 191)
- Making Buzzer Settings (page 193)

For information about VessRAID's audible alarm and LEDs, see "Chapter 9: Troubleshooting" on page 265.

Initial Connection

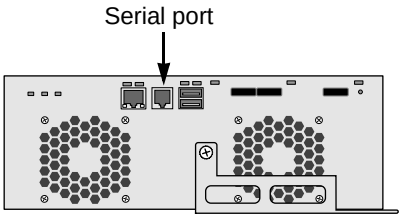
Making an initial connection includes the following functions:

- Making a Serial Connection (below)
- Making a Telnet Connection (page 131)
- Logging In (page 131)
- Accessing Online Help (page 133)
- Exiting the CLU (page 133)
- Logging Out of the CLI (page 133)
- Logging Back Into the CLI and CLU (page 133)

Making a Serial Connection

Before you begin, be sure the RJ11-to-DB9 serial data cable is connected between the Host PC and VessRAID, and that both machines are booted and running.

Figure 1. Serial port on the controller



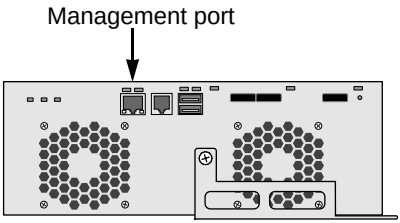
Then do the following actions:

1. Change your terminal emulation program settings to match the following specifications:
   - Bits per second: 115200
   - Data bits: 8
   - Parity: None
   - Stop bits: 1
   - Flow control: none
2. Start your PC's terminal VT100 or ANSI emulation program.
3. Press Enter once to launch the CLI.

Making a Telnet Connection

A Telnet connection requires a network connection between the Host PC and VessRAID controller's Management (Ethernet) port.

Figure 2. Management port on the controller



To start the telnet program:

1. Go to the command line prompt (Windows) or click the terminal icon (Linux).
2. Type **telnet 192.168.1.56 2300** and press Enter.

   The IP address above is only an example.
   Use your VessRAID's Management port IP address.
   2300 is the Telnet port for the VessRAID.
3. Press Enter once to launch the CLI.

Logging In

1. At the Login prompt, type the user name and press Enter.

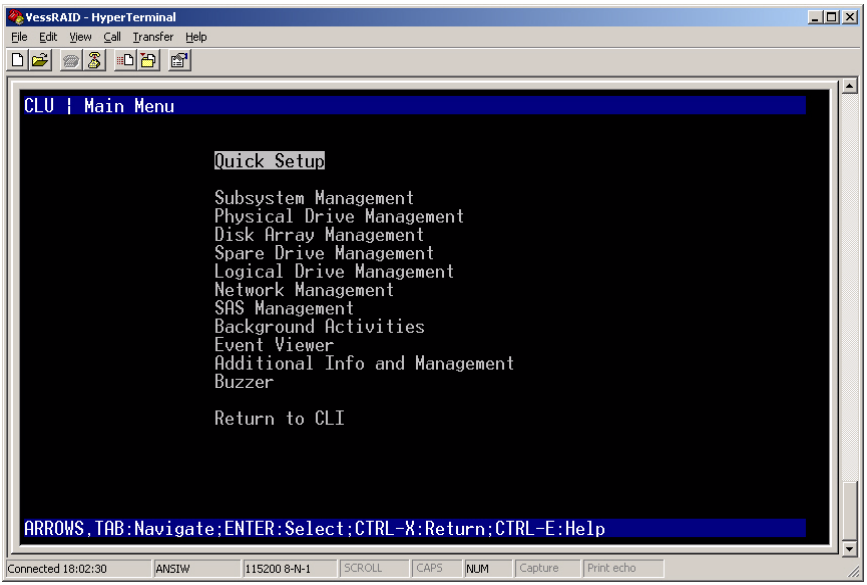
   The default user name is *administrator*.
2. At the Password prompt, type the password and press Enter.

   The default password is *password*.

   The CLI screen appears.
3. At the administrator@cli> prompt, type **menu** and press Enter.

   The CLU Main Menu appears.

Figure 3. CLU main menu



Quick Setup – A sequence of four steps to setup System Date & Time, Management Port, and RAID Configuration.

Subsystem Management – View controller information, lock/unlock the controller, set date and time, and monitor the enclosure.

Physical Drive Management – View disk drive assignments and parameters, change disk drive cache settings and command queuing, and locate a physical drive.

Disk Array Management – View disk array information, create and delete disk arrays, transport, rebuild, PDM, and transition functions, and locate a disk array, create and delete logical drives.

Spare Drive Management – View a list of spare drives, create, modify, and delete spare drives, and run spare check.

Logical Drive Management – View logical drive information, name logical drives, initialization and redundancy check, and locate a logical drive.

Network Management – Set IP address for Management Port, gateway, and DNS server; subnet mask.

SAS Management – SAS Port information, settings, status, and statistics; SAS Initiators.

Background Activity – Settings for Media Patrol, Auto Rebuild, Rebuild, Migration, PDM, Transition, Synchronization, Initialization, Redundancy Check rate, and thresholds.

Event Viewer – View the event logs.

Additional Info and Management – Spare Drives, LUN Mapping, User management, Email, SLP, Web Server, Telnet, SNMP, and Netsend settings, firmware flash, clear statistics and restore factory default settings.

Buzzer – Enable, disable or silence the buzzer (audible alarm).

Accessing Online Help

To access online help on any CLU screen, press Ctrl-E.

To return to the CLU, press Enter.

Exiting the CLU

1. Highlight *Return to Previous Menu* and press Enter.

   Repeat this action until you arrive at the Main Menu.
2. From the Main Menu, highlight *Return to CLI* and press **Enter** to exit
3. Close the terminal emulation, Telnet or terminal window.

Logging Out of the CLI

When you shut down or restart the VessRAID subsystem, you are automatically logged out of the CLI.

To manually log out of the CLI (no shut down or restart):

At the username@cli> prompt, type **logout** and press Enter.

The prompt changes to cli>.

Logging Back Into the CLI and CLU

To log into the CLI and CLU after a manual logout:

1. At the cli:> prompt, type **login** followed by your user name and press Enter.
2. At the Password: prompt, type your password and press Enter.
3. At the username@cli> prompt, type **menu** and press Enter to open the CLU.

Running Quick Setup

Quick Setup is discussed under “Setting up the Serial Connection” on page 25.

Managing the Subsystem

Subsystem Management includes the following functions:

- Setting an Alias for the Subsystem (page 135)
- Running Media Patrol (page 135)
- Locking or Unlocking the Subsystem (page 135)
- Setting Subsystem Date and Time (page 136)

Setting an Alias for the Subsystem

An alias is optional. To set an Alias for this subsystem:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Type and alias into the Alias field.

   Maximum of 48 characters. Use letters, numbers, space between words and underscore.
3. Press Ctrl-A to save your settings.

Running Media Patrol

Media Patrol is a routine maintenance procedure that checks the magnetic media on each disk drive. Media Patrol checks all physical drives assigned to disk arrays and spare drives. It does not check unconfigured drives.

To start, stop, pause or resume Media Patrol:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Media Patrol* and press enter.
3. Highlight *Start*, *Stop*, *Pause*, or *Resume* and press Enter.
4. If you chose Stop, press Y to confirm.

Locking or Unlocking the Subsystem

The lock prevents other sessions (including by the same user) from making a configuration change to the controller until the lock expires or a forced unlock is done. When the user who locked the controller logs out, the lock is automatically released.

Setting the Lock

To set the lock:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Lock Management* and press Enter.
3. In the Lock Time field, type a lock time in minutes.

   1440 minutes = 24 hours

4. Highlight *Lock* and press Enter.

Resetting the Lock

To reset the lock with a new time:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Lock Management* and press Enter.
3. In the Lock Time field, type a lock time in minutes.
   1 to 1440 minutes (24 hours)
4. Highlight *Renew* and press Enter.

Releasing the Lock

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Lock Management* and press Enter.
3. Highlight *Unlock* and press Enter.

Releasing a Lock set by another user

To release somebody else's lock:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Lock Management* and press Enter.
3. Highlight *Force Unlock* and press the Spacebar to change to *Yes*.
4. Highlight *Unlock* and press Enter.

Setting Subsystem Date and Time

Use this screen to make Date and Time settings:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Modify System Date and Time* and press Enter.
3. Highlight the System Date or System Time setting.
4. Press the backspace key to erase the current value.
5. Type in a new value.
6. Press Ctrl-A to save your settings.

Managing the Controller

Controller Management includes the following functions:

- Viewing Controller Information (page 137)
- Clearing an Orphan Watermark (page 137)
- Making Controller Settings (page 137)
- Locating the Controller (page 138)

Viewing Controller Information

Controller Management includes information, settings and statistics.

To access Controller Management:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Controller Management* and press Enter.
3. Highlight the controller you want and press Enter.

   Basic Controller information displays.

To access additional controller information, highlight *Advanced Information* and press Enter.

To access controller statistics, highlight *Controller Statistics* and press Enter.

Clearing an Orphan Watermark

This condition is the result of a disk drive failure during an NVRAM RAID level migration on a disk array.

To clear an orphan watermark:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Controller Management* and press Enter.
3. Highlight one of the controllers and press Enter.
4. Highlight *Clear Orphan Watermark* and press Enter.

The condition is cleared. See “Physical Drive Failed” on page 294 for more information.

Making Controller Settings

If your subsystem has two controllers, any settings you make to one controller will automatically apply to the other controller.

To make Controller settings:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Controller Management* and press Enter.

3. Highlight the controller you want and press Enter.
4. Highlight *Controller Settings* and press Enter.
5. Make the following settings as required:
   - Type and alias into the Alias field.

     Maximum of 48 characters. Use letters, numbers, space between words and underscore. An alias is optional.
   - Highlight *Coercion* and press the spacebar to toggle between *Enabled* and *Disabled*.
   - Highlight *Coercion Method* and press the spacebar to toggle through:

     GB Truncate – Reduces the capacity to the nearest 1 GB boundary

     10 GB Truncate – Reduces the capacity to the nearest 10 GB boundary

     Grp (group) Rounding – Uses an algorithm to determine truncation. Results in the maximum amount of usable drive capacity

     Table Rounding – Applies a predefined table to determine truncation
   - Highlight *Cache Flush Interval* and press the backspace key to erase the current value. Type a new interval value (1 to 12 seconds).
   - Highlight *SMART* and press the spacebar to toggle between *Enable* and *Disable*.
   - Highlight *SMART Poll Interval* and press the backspace key to erase the current value. Type a new interval value (1 to 1440 minutes).
   - Highlight *Poll Interval* and press the backspace key to erase the current value. Type a new interval value (15 to 255 seconds).
   - Highlight *Adaptive Writeback Cache* and press the spacebar to toggle between *Enabled* and *Disabled*.
6. Press Ctrl-A to save your settings.

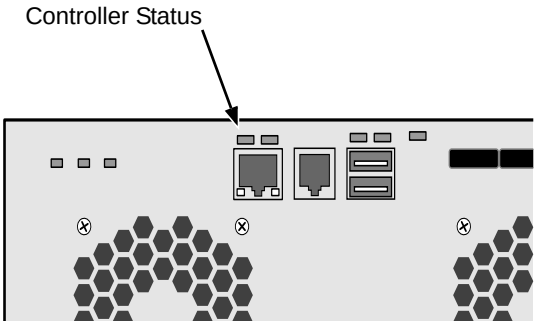
Locating the Controller

To locate this controller:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Controller Management* and press Enter.
3. Highlight the controller you want and press Enter.
4. Highlight *Locate Controller* and press Enter.

   The Controller Status LED blinks green for one minute.

Figure 4. Controller Status LED



Managing the Enclosure

Enclosure Management includes the following functions:

- Viewing Enclosure Information (page 140)
- Viewing Power Supply Status (page 140)
- Locating a Power Supply (page 141)
- Viewing Cooling Unit Status (page 141)
- Viewing Voltage Sensor Status (page 141)
- Viewing Temperature Sensor Status (page 141)
- Setting Temperature Thresholds (page 142)
- Checking the Batteries (page 142)
- Reconditioning a Battery (page 143)
- Locating an Enclosure (page 143)
- Viewing Enclosure Topology (page 144)

Viewing Enclosure Information

Enclosure Management includes information, status, settings and location. To access Enclosure Management:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Enclosure Management* and press Enter.

To access FPU VPD information (vital product data on field replaceable units), highlight *FPU VPD Information* and press Enter.

This function lists the battery backup unit and backplane.

Viewing Power Supply Status

To view the status of the power supplies:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight E*nclosure Management* and press Enter.
3. Highlight *Power Supply Units* and press Enter.

   The screen displays the status of VessRAID's power supply. If any status differs from *Powered On and Functional*, there is a power supply malfunction. See "Replacing a Power Supply" on page 224.

Locating a Power Supply

To locate a power supply:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight E*nclosure Management* and press Enter.
3. Highlight *Power Supplies* and press Enter.
4. Highlight *Locate Power Supply* and press Enter.

   The LED on the selected power supply blinks for one minute.

Viewing Cooling Unit Status

To view the status of the blowers:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight E*nclosure Management* and press Enter.
3. Highlight *Cooling Units* and press Enter.

   The screen displays the status and speed of VessRAID's cooling fans. If the speed is below the Healthy Threshold, there is a fan malfunction. See "Replacing a Cooling Fan" on page 226.

Viewing Voltage Sensor Status

To view the status of the voltage sensors:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight E*nclosure Management* and press Enter.
3. Highlight *Voltage Sensors* and press Enter.

   If any voltage is outside the Healthy Threshold values, there is a voltage malfunction in the enclosure. See "Chapter 9: Troubleshooting" on page 265.

Viewing Temperature Sensor Status

To view the status of the temperature sensors:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight E*nclosure Management* and press Enter.
3. Highlight *Temperature Sensors* and press Enter.

   If any temperature exceeds the Healthy Threshold value, there is an overheat condition in the enclosure. See "Setting Temperature Thresholds" on page 142 and "Chapter 9: Troubleshooting" on page 265.

Setting Temperature Thresholds

To change temperature thresholds:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Enclosure Management* and press Enter.
3. Highlight *Enclosure Settings* and press Enter.
4. Highlight the Temperature Warning threshold you want to change.
5. Press the backspace key to erase the current value.
6. Type a new interval value in degrees C.
7. Press Ctrl-A to save your settings.

Checking the Batteries

This feature enables you monitor and recondition the subsystem battery or batteries.

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Enclosure Management* and press Enter.
3. Highlight *Batteries* and press Enter.
4. Highlight the battery you want to monitor and press Enter.

Battery Notes

Each battery works with a controller. If the battery is present in the subsystem but the corresponding controller is not present, the battery will not appear in the interface.

If a battery does not reflect normal conditions and it is not currently under reconditioning, run the Recondition function before you replace the battery. See “Reconditioning a Battery” on page 143.

Reconditioning fully discharges, then fully recharges the battery. During reconditioning, if the Adaptive Writeback Cache function is enabled, the controller cache is set to *Write Thru*. After reconditioning, the cache is reset to *Write Back*. See “Making Controller Settings” on page 137.

If a battery reaches the threshold temperature while charging or discharging, the charge or discharge pauses and the blower runs at high speed until the battery temperature falls below the threshold.

If the battery does not maintain normal values after a Recondition, replace the battery. See “Replacing the Cache Battery” on page 228.

VessRAID automatically reconditions the battery every two months.

When you install a new battery, the cycle count shows 0. VessRAID automatically runs a recondition on the battery to verify it. If you restart the subsystem or

controller before reconditioning is finished, the battery is charged to 100%, then reconditioning starts again.

Reconditioning a Battery

To recondition the subsystem battery:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Enclosure Management* and press Enter.
3. Highlight *Batteries* and press Enter.
4. Highlight the battery you want to recondition and press Enter.
5. Highlight *Start Reconditioning* and press Enter.
6. Press Y to confirm.

   Reconditioning fully discharges, then fully recharges the battery. During reconditioning, if the Adaptive Writeback Cache function is enabled, the controller cache is set to *Write Thru*. After reconditioning, the cache is reset to *Write Back*. See “Making Controller Settings” on page 137.

Locating an Enclosure

This feature helps you identify the physical VessRAID enclosure you are working with through the CLU.

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Enclosure Management* and press Enter.
3. Highlight *Locate Enclosure* and press Enter.

   The disk status LEDs and the LEDs on the back of the enclosure blink for one minute. See the Figures below.

Figure 5. Disk Status LEDs

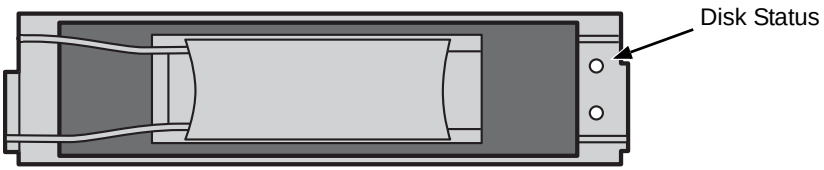
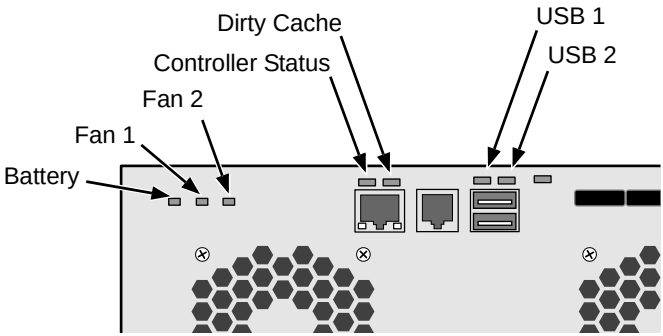


Figure 6. VessRAID enclosure LEDs



Viewing Enclosure Topology

Enclosure topology refers to the manner in which the data paths among the enclosures are connected:

- **Individual Subsystem** – One VessRAID subsystem
- **JBOD Expansion** – One VessRAID subsystem plus one or more VessJBOD expansion subsystems, managed through the VessRAID or head unit

The physical connections for these arrangements are discussed in “Chapter 2: VessRAID Installation” on page 9.

To view enclosure topology:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Enclosure Topology* and press Enter.

Managing Physical Drives

Physical Drive Management includes the following functions:

- Making Global Physical Drive Settings (page 145)
- Setting an Alias (page 146)
- Viewing Advanced Information (page 146)
- Viewing Physical Drive Statistics (page 146)
- Clearing Stale and PFA Conditions (page 146)
- Forcing a Physical Drive Offline or Online (page 147)
- Locating a Physical Drive (page 147)

Making Global Physical Drive Settings

All physical drive settings are made globally, except for setting an alias, which applies to individual drives.

To make global physical drive settings:

1. From the Main Menu, highlight *Physical Drive Management* and press Enter.
2. Highlight *Global Physical Drives Settings* and press Enter.
3. Change the following settings as required.

   For SATA drives:

   - Highlight *Write Cache* and press the spacebar to toggle between *Enabled* and *Disabled*.
   - Highlight *Read Look Ahead Cache* and press the spacebar to toggle between *Enabled* and *Disabled*.
   - Highlight *CmdQueuing* and press the spacebar to toggle between *Enabled* and *Disabled*.
   - Highlight *DMA Mode* and press the spacebar to toggle through UDMA 0–5 and MDMA 0–2.

   For SAS drives:

   - Highlight *Write Cache* and press the spacebar to toggle between *Enabled* and *Disabled*.
   - Highlight *Read Look Ahead Cache* and press the spacebar to toggle between *Enabled* and *Disabled*.
   - Highlight *CmdQueuing* and press the spacebar to toggle between *Enabled* and *Disabled*.
   - Highlight *Read Cache* and press the spacebar to toggle between *Enabled* and *Disabled*.
4. Press Ctrl-A to save your settings.

Setting an Alias

An alias is optional. To set an Alias for a physical drive:

1. From the Main Menu, highlight *Physical Drive Management* and press Enter.
2. Highlight the physical drive of your choice and press Enter.
3. Type an alias into the Alias field.

   Maximum of 32 characters. Use letters, numbers, space between words and underscore.
4. Press Ctrl-A to save your settings.

Viewing Advanced Information

To view advanced information about the selected physical drive:

1. From the Main Menu, highlight *Physical Drive Management* and press Enter.
2. Highlight the physical drive of your choice and press Enter.
3. Highlight *Advanced Information* and press Enter.

Viewing Physical Drive Statistics

To view the statistics for the selected physical drive:

1. From the Main Menu, highlight *Physical Drive Management* and press Enter.
2. Highlight the physical drive of your choice and press Enter.
3. Highlight *Physical Drive Statistics* and press Enter.

Clearing Stale and PFA Conditions

The Clear Stale and Clear PFA functions only appear when those conditions exist on the physical drive. To clear a Stale or PFA condition on a physical drive:

1. From the Main Menu, highlight *Physical Drive Management* and press Enter.
2. Highlight the physical drive of your choice and press Enter.
3. Highlight *Clear Stale* or *Clear PFA* and press Enter.

If a physical drive is still online and shows a PFA error but “Clear PFA” does not appear, use PDM to copy the data to a new physical drive. Go to Disk Array Info and Settings.

If a physical drive is offline and shows a PFA error, rebuild the disk array. Go to Disk Array Info and Settings. After rebuilding, the drive will show Stale. Run Clear Stale then run Clear PFA.

If the physical drive with a PFA error is a spare, you must delete the drive as a spare, then Clear PFA will be available.

After you clear a PFA error, watch for another PFA error to appear. If it does, replace the physical drive.

Forcing a Physical Drive Offline or Online

This function enables you to force an:

- Online physical drive to go Offline
- Offline physical drive to go Online

The Force Offline/Online function appears only for physical drives that are assigned to disk arrays.

Caution

Forcing a physical drive offline or online is likely to cause data loss. Back up your data before you proceed. Use these functions only when required.

To force a physical drive offline or online:

1. From the Main Menu, highlight *Physical Drive Management* and press Enter.
2. Highlight *Global Physical Drives Settings* and press Enter.
3. Highlight the physical drive of your choice and press Enter.
4. Highlight *Force Offline* or *Force Online* and press Enter.
5. Press Y to confirm.

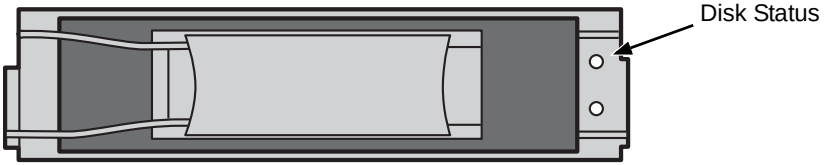
Locating a Physical Drive

This feature helps you identify a physical drive within the VessRAID enclosure you are working with through the CLU. To locate a physical drive:

1. From the Main Menu, highlight *Physical Drive Management* and press Enter.
2. Highlight the physical drive of your choice and press Enter.
3. Highlight *Locate Physical Drive* and press Enter.

   The disk status LED for the physical drive blinks for one minute.

Figure 7. Disk Status LEDs



Managing Disk Arrays

Disk Array Management includes the following functions:

- Creating a Disk Array (page 148)
- Deleting a Disk Array (page 152)
- Viewing Disk Array Information (page 152)
- Setting an Alias for a Disk Array (page 153)
- Enabling Media Patrol on a Disk Array (page 154)
- Enabling PDM on a Disk Array (page 154)
- Preparing the Disk Array for Transport (page 154)
- Rebuilding a Disk Array (page 154)
- Migrating a Disk Array (page 155)
- Running PDM (page 156)
- Running Transition on a Disk Array (page 156)
- Locating a Disk Array (page 156)
- Locating a Disk Array (page 156)
- Creating a Logical Drive (page 157)
- Deleting a Logical Drive (page 158)

Creating a Disk Array

The CLU provides three methods of creating a disk array:

- **Automatic** – Creates a new disk array following a default set of parameters. Makes one logical drive automatically. Also makes a hot spare drive for all RAID levels except RAID 0, if at least five unconfigured physical drives are available. If you have multiple enclosures, multiple disk array and logical drive sets are created. See “Creating a Disk Array – Automatic” on page 149.
- **Express** – You choose the parameters for a new disk array by specifying the characteristics you want. You can create multiple logical drives at the same time, however they will all be identical. You can choose to make a hot spare drive for all RAID levels except RAID 0, if at least five unconfigured physical drives are available. See “Creating a Disk Array – Express” on page 150.
- **Advanced** – You directly specify all parameters for a new disk array. Makes one logical drive automatically. You can create additional logical drives at a later time, if additional configurable capacity is available. Does not make a hot spare drive. See “Creating a Disk Array – Advanced” on page 151.

Creating a Disk Array – Automatic

To create a disk array using the Automatic feature:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight *Create New Array* and press Enter.
3. Highlight *Configuration Method* and press the spacebar to toggle to *Automatic*.
4. Review the proposed configuration of disk array and logical drive(s).
   - To accept the proposed configuration and create the disk array and logical drive(s), highlight *Save Configuration* and press Enter.
   - To reject the proposed configuration, highlight *Cancel Array Configuration* and press Enter. You will return to the Disk Arrays Summary screen.

     To create a disk array with different characteristics, repeat the steps above specifying different parameters but choose the Express or Advanced option.

     If you have both Hard Disk Drives (HDD) and Solid State Drives (SSD), separate disk array and logical drive sets will be created for your HDDs and for your SSDs. These two drive types cannot be mixed in the same disk array.

Creating a Disk Array – Express

To create a disk array using the Express feature:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight *Create New Array* and press Enter.
3. Highlight *Configuration Method* and press the spacebar to toggle to *Express*.
4. Highlight *Configuration Method* and press to spacebar to choose each of the following characteristics for your disk array:
   - Redundancy
   - Capacity
   - Performance
   - Spare Drive
5. Highlight *Number of Logical Drives* and press the backspace key to erase the current value.
6. Enter the number of logical drives you want.
7. Highlight *Application Type* and press the spacebar to toggle though the applications and choose the best one for your disk array.
   - File Server
   - Video Stream
   - Transaction Data
   - Transaction Log
   - Other
8. Press Ctrl-A to save your settings and move to the next screen.
9. Review the proposed configuration of disk array and logical drive(s).

   To accept the proposed configuration and create the disk array and logical drive(s), highlight *Save Configuration* and press Enter.

   To reject the proposed configuration, highlight *Cancel Array Configuration* and press Enter. You will return to the Disk Arrays Summary screen.

   To create a disk array with different characteristics, highlight *Create New Array* and press Enter. Repeat the steps above specifying different parameters.

   If you have both Hard Disk Drives (HDD) and Solid State Drives (SSD), separate disk arrays will be created for your HDDs and for your SSDs. Each array will have the number of logical drives that you specified.

Creating a Disk Array – Advanced

For more information on the choices below, see “Chapter 8: Technology Background” on page 233.

To create a disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight *Create New Array* and press Enter.
3. Highlight *Configuration Method* and press the spacebar to toggle to *Advanced*.
4. Choose whether to enable Media Patrol and PDM.
5. If you want to specify an alias to the disk array, highlight *Alias* and type a name.

   Maximum of 32 characters. Use letters, numbers, space between words and underscore.
6. Highlight *Save Settings* and Continue and press Enter.
7. Highlight a physical drive you want to add to your array and press the spacebar to choose it.

   Repeat this action until you have selected all the physical drives for your array.

   Note that you cannot mix HDDs and SSDs in the same disk array.
8. Highlight *Save Settings and Continue* and press Enter.
9. If you want to specify an alias to the logical drive, highlight *Alias* and type a name.

   Maximum of 32 characters. Use letters, numbers, space between words and underscore.
10. Highlight *RAID Level* and press the spacebar to toggle though a list of available RAID levels.
11. If you want to create multiple logical drives, highlight *Capacity*, press the backspace key to remove the current value, then type a new smaller value.
12. Highlight *Number of Axles* and press the spacebar to choose the number of axles. Applies to RAID 50 and 60 only.
13. Highlight *Stripe* and press the spacebar to toggle through stripe sizes and choose 64 KB, 128 KB, 256 KB, 512 KB, or 1 MB.
14. Highlight *Sector* and press the spacebar to toggle through sector sizes and choose 512 B, 1 KB, 2 KB, or 4 KB.
15. Highlight *Write Policy* and press the spacebar to toggle write cache policy between *WriteBack* and *WriteThru* (write though).
16. Highlight *Read Policy* and press the spacebar to toggle read cache policy though *ReadCache*, *ReadAhead*, and *NoCache*.

17. Highlight *Save Logical Drive* and press Enter.
18. Review logical drive(s) you are about to create for your new array. Then do one of the following actions:
    - If you agree with the logical drive(s) as specified, highlight *Complete Disk Array Creation* and press Enter. A note will appear to remind you to set up LUN mapping for your new logical drive(s). Press any key to continue.
    - If you specified less than the full capacity for the logical drive in the previous screen, and you want to add another logical drive now, highlight *Create New Logical Drive* and press Enter.
    - If you do not agree with the logical drive(s), highlight *Return to Previous Screen* and press Enter to begin the process again.

Deleting a Disk Array

Caution

When you delete a disk array, you delete all the logical drives and the data they contain. Back up all important data before deleting a disk array.

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want to delete and press the spacebar to mark it.
   The mark is an asterisk (*) to the left of the listing.
3. Highlight *Delete Marked Arrays* and press Enter.
4. Press Y to confirm the deletion.

Viewing Disk Array Information

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
   The information and settings screen appears.
3. Highlight any of the following and press Enter to view a list of:
   - Spare drives in this array, dedicated and global
   - Physical drives in this array
   - Logical drives in this array

Disk Array Operational Status

- **OK** – The normal state of a disk array. For RAID Levels other than RAID 0 (Striping), the disk array has full redundancy.

- **Synchronizing** – When you first create a disk array, the disk array synchronizes. During that time, your data is available. However, access will be slower until synchronizing is done.
- **Critical/Degraded** – This condition results from a physical drive failure. Your data is still available. However, the disk array has lost redundancy (fault tolerance). You must determine the cause of the problem and correct it. See “Critical & Offline Disk Arrays” on page 290.
- **Rebuilding** – This condition is temporary. When a physical drive has been replaced, the disk array automatically begins rebuilding in order to restore redundancy (fault tolerance). Your data is still available. However, access will be slower until rebuilding is done.
- **Transport Ready** – The result of a successful Prepare for Transport operation. You remove the physical drives of this disk array and move them to another enclosure or to different drive slots in the same enclosure. After you relocate the physical drives, the disk array status will show OK.

Setting an Alias for a Disk Array

This function sets an alias for the disk array. To set an alias:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. To set an alias for this disk array, highlight *Alias* and type an alias into the field.

   Maximum of 32 characters. Use letters, numbers, space between words and underscore. An alias is optional.
4. Press Ctrl-A to save your settings.

Accepting an Incomplete Array

This condition is the result of a missing physical drive. See “Incomplete Array” on page 293 before you use this function.

To accept an incomplete array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *Accept Incomplete Array* and press Enter.

Enabling Media Patrol on a Disk Array

Media Patrol checks the magnetic media on physical drives.

To enable or disable Media Patrol:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *Media Patrol* and press the spacebar to toggle between *Enable* and *Disable*.
4. Press Ctrl-A to save your settings.

Enabling PDM on a Disk Array

This function enables and disables Predictive Data Migration (PDM).

To enable or disable PDM:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *PDM* and press the spacebar to toggle between *Enable* and *Disable*.
4. Press Ctrl-A to save your settings.

See “Running PDM” on page 156.

Preparing the Disk Array for Transport

To run the Transport function on a disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *Transport* and press Enter.
4. Press Y to confirm.

Rebuilding a Disk Array

Before you can rebuild, you must have a replacement physical drive of adequate capacity or your disk array. To rebuild a disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *Background Activities* and press Enter.
4. Highlight *Rebuild* and press Enter.
5. Specify the source and target physical drives.

The available drives are either HDD or SSD, depending on the type of drives in the array.

6. Highlight *Start* and press Enter.

Migrating a Disk Array

In order to migrate RAID level, you may have to add physical drives. For more information, see “RAID Level Migration” on page 252.

To migrate a disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *Background Activities* and press Enter.
4. Highlight *Migration* and press Enter.
5. Highlight the physical drive you want to add and press the spacebar to choose it.

   The available drives are either HDD or SSD, depending on the type of drives in the array.

   Repeat this action to add more physical drives.

Notes

- You can add physical drives to a RAID 50 or 60 array but you cannot change the number of axles.
- If you add an odd number of physical drives to a RAID 10 array, it will become a RAID 1E array by default.

6. Highlight *Save Settings and Continue* and press Enter.
7. To change RAID level, Highlight the logical drive in the list and press Enter.
8. Highlight *RAID Level* and press the spacebar to toggle through the available RAID levels.
9. Optional. If you want to increase capacity, highlight *Expand Capacity* and press the spacebar to toggle to *Yes*.
10. Optional. If you want to increase capacity, highlight *Capacity*, press the backspace key to erase the current logical drive capacity and type in the new value.

    The new value must be equal or larger than the current capacity.
11. Highlight *Save Logical Drive* and press Enter.

    The screen returns to Disk Array Migration Logical Drives.
12. Highlight *Complete Disk Array Migration* and press Enter.
13. In the confirmation message, press Y to confirm.

The screen jumps to Disk Arrays Summary.

Running PDM

Be sure PDM must be enabled. See “Enabling PDM on a Disk Array” on page 154.

To run Predictive Data Migration on a disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *Background Activities* and press Enter.
4. Highlight *Predictive Data Migration* and press Enter.
5. Specify the source and target physical drives.

   The available drives are either HDD or SSD, depending on the type of drives in the array.
6. Highlight *Start* and press Enter.

Running Transition on a Disk Array

Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare drive. For more information, see “Transition” on page 261.

In order to run Transition:

- The spare drive must be Revertible.
- You must have an unconfigured physical drive of the same or larger capacity, and the same type, HDD or SSD, to replace the spare drive.

To run Transition on a disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *Background Activities* and press Enter.
4. Highlight *Transition* and press Enter.
5. Specify the source and target physical drives.

   The available drives are either HDD or SSD, depending on the type of drives in the array.
6. Highlight *Start* and press Enter.

Locating a Disk Array

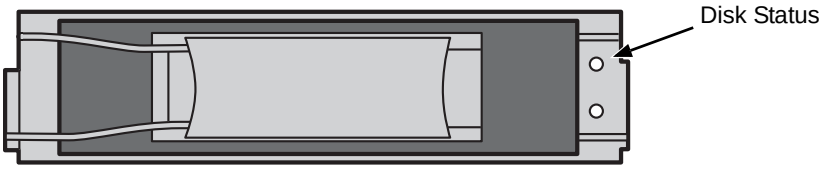
This feature helps you identify the physical drives assigned to the disk array you are working with in the CLU.

To locate a disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *Locate Disk Array* and press Enter.

   The disk status LEDs for the physical drives in the disk array blink for one minute.

Figure 8. Disk Status LED



Creating a Logical Drive

You can create logical drives on existing disk arrays if there is available space in the array. For more information on the choices below, see “Chapter 8: Technology Background” on page 233.

To create a logical drive from an existing disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array in which you want to create a logical drive and press Enter.
3. Highlight *Create New Logical Drive* and press Enter.

   The Disk Array ID number and Maximum capacity available for the new logical drive are displayed.
4. Highlight the following parameters and press the backspace key to erase the current value:
   - **Alias** – Type an alias into the field, if desired. Maximum of 32 characters. Use letters, numbers, space between words and underscore.
   - **Capacity** – Maximum capacity shown. Enter a smaller capacity if desired.
5. Highlight the following parameters and press the spacebar to toggle though the available choices:
   - **Stripe size** – Press the spacebar to choose: 64 KB, 128 KB, 256 KB, 512 KB, or 1 MB
   - **Sector size** – Press the spacebar to choose: 512 B; 1 KB, 2 KB, or 4 KB

- **Write Policy** – Press spacebar to choose: Write Back or Write Through
- **Read Policy** – Press spacebar to choose: No Cache, Read Cache, or Read Ahead Cache

6. Highlight *Number of Axles* and press the spacebar to choose the number of axles. Applies to RAID 50 and 60 only.
7. Press Ctrl-A to save your settings.

Note

If you did not use all of the available capacity of the disk array, you can create an additional logical drive at this point.

Deleting a Logical Drive

Caution

When you delete a logical drive, you delete all the data it contains. Back up all important data before deleting a logical drive.

To delete a logical drive from a disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array that contains the logical drive you want to delete and press Enter.
3. Highlight the logical drive you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*) to the left of the listing.
4. Highlight *Delete Marked Logical Drives* and press Enter.
5. Press Y to confirm the deletion.

Managing Spare Drives

Spare Drive Management includes the following functions:

- Viewing a list of Spare Drives (page 159)
- Creating a Spare Drive (page 159)
- Making Spare Drive Settings (page 160)
- Running Spare Check (page 160)
- Deleting a Spare Drive (page 161)

Viewing a list of Spare Drives

To view a list of spare drives:

From the Main Menu, highlight *Spare Drive Management* and press Enter.

A list of the current spare drives appears, including the following parameters:

- **ID number**
- **Operational Status**
- **Physical Drive ID number**
- **Configured Capacity**
- **Revertible** – The spare drive returns to spare status after you replace the failed drive in the disk array. See “Transition” on page 261 for more information.
- **Type** – Global (all disk arrays) or Dedicated (to specified disk arrays)
- **Dedicated to Array** – The array to which a dedicated spare is assigned

Creating a Spare Drive

Only unconfigured physical drives can be used to make spares. Check your available drives under Physical Drive Management. See “Managing Physical Drives” on page 145.

1. From the Main Menu, highlight *Spare Drive Management* and press Enter.
2. Highlight *Create New Spare Drive* and press Enter.
3. Highlight *Physical Drive Number* and press the backspace key to erase the current value, then type the new value.

   Specify the number of the physical drive you want for your spare. The available drive numbers are in parentheses.
4. Highlight *Revertible* and press the spacebar to toggle between *Yes* and *No*.

   A revertible drive can be returned to spare status after you replace the failed drive in a disk array. See “Transition” on page 261 for more information.
5. Highlight *Spare Type* and press the spacebar to toggle between *Dedicated* and *Global*.

Dedicated means this spare drive can only be used with the specified disk arrays. Global means this spare drive can be used by any disk array.

6. If you chose Dedicated, highlight *Dedicated to Arrays* and press the backspace key to erase the current value, then type the new value.

   Specify the number(s) of the disk array(s) you want to assign your spare. The current disk arrays are listed in parentheses.

   A dedicated spare drive must be the same drive type, HDD or SSD, as the drives in the assigned array.

7. Press Ctrl-A to save the spare drive.

Making Spare Drive Settings

To change spare drive settings:

1. From the Main Menu, highlight *Spare Drive Management* and press Enter.

   A list of the current spare drives appears, including the following parameters:

2. Highlight the spare drive you want to change and press Enter.
3. Highlight the setting you want to change:
   - **Revertible** – A revertible drive can be returned to spare status after you replace the failed drive in a disk array. See “Transition” on page 261 for more information.
   - **Type** – Dedicated means this spare drive can only be used with the specified disk array(s). Global means this spare drive can be used by any disk array.
4. Press the spacebar to toggle between the choices.
5. For dedicated spares, type the array number the spare is assigned to.
6. Press Ctrl-A to save your settings.

Running Spare Check

To run Spare Check:

1. From the Main Menu, highlight *Spare Drive Management* and press Enter.

   A list of the current spare drives appears.

2. Highlight the spare drive you want to check and press Enter.
3. Highlight *Start Spare Check* and press Enter.

   The results appear next to Spare Check Status.

Deleting a Spare Drive

Caution

If the spare drive you delete is the only spare, the controller will not rebuild a critical array until you provide a new spare drive.

To delete a spare drive:

1. From the Main Menu, highlight *Spare Drive Management* and press Enter.

   A list of the current spare drives appears.
2. Highlight the spare drive you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*) to the left of the listing.
3. Highlight *Delete Marked Spare Drives* and press Enter.
4. Press Y to confirm the deletion.

Managing Logical Drives

The Logical Drive Management function deals with settings and functions of existing logical drives. To create or delete a logical drive, see “Managing Disk Arrays” on page 148. Logical drive management includes:

- Viewing Logical Drive Information (page 162)
- Setting an Alias for a Logical Drive (page 162)
- Setting Write Cache Policy (page 162)
- Setting Read Cache Policy (page 163)
- Initializing a Logical Drive (page 163)
- Running Redundancy Check (page 164)
- Locating a Logical Drive (page 164)

Viewing Logical Drive Information

To view logical drive information:

1. From the Main Menu, highlight *Logical Drive Management* and press Enter.
2. Highlight the logical drive you want and press Enter.

   The information and settings screen appears.
3. Highlight any of the following and press Enter to view more information:
   - **Check Table** – Read Check, Write Check, and Inconsistency Check Tables
   - **Logical Drive Statistics**

Setting an Alias for a Logical Drive

To set an alias for a logical drive:

1. From the Main Menu, highlight *Logical Drive Management* and press Enter.
2. Highlight the logical drive you want and press Enter.
3. To set an alias for this disk array, highlight *Alias* and type an alias into the field.

   Maximum of 32 characters. Use letters, numbers, space between words and underscore. An alias is optional.
4. Press Ctrl-A to save your settings.

Setting Write Cache Policy

To set write cache policy on a logical drive:

1. From the Main Menu, highlight *Logical Drive Management* and press Enter.
2. Highlight the logical drive you want and press Enter.

3. To set write cache policy for this logical drive, highlight *WritePolicy* and press the spacebar to toggle between *WriteBack* and *WriteThru* (write though).
4. Press Ctrl-A to save your settings.

Setting Read Cache Policy

To set read cache policy on a logical drive:

1. From the Main Menu, highlight *Logical Drive Management* and press Enter.
2. Highlight the logical drive you want and press Enter.
3. To set read cache policy for this logical drive, highlight *ReadPolicy* and press the spacebar to toggle though *ReadCache*, *ReadAhead* and *None*.
4. Press Ctrl-A to save your settings.

Initializing a Logical Drive

This function sets all data bits in the logical drive to zero.

Caution

When you initialize a logical drive, you delete all the data it contains. Back up all important data before initializing a logical drive.

To initialize a logical drive:

1. From the Main Menu, highlight *Logical Drive Management* and press Enter.
2. Highlight the logical drive you want and press Enter.
3. Highlight *Background Activity* and press Enter.
4. Highlight *Start Initialization* and press Enter.

   The initialization parameters appear.

   - **Initialization pattern** – The default 00000000 is best for most applications
   - **Quick Initialization** – Yes means only the first and last sections of the logical drives are initialized. No means the entire logical drive is initialized.
   - **Quick Initialization Size** – Enter a value for the first and last sections of the logical drive to be initialized or use the default 64 MB.

   To change a parameter, highlight it and press the backspace key to erase the current value, then type the new value.
5. Highlight *Start* and press Enter.

   If necessary, you can pause and resume or stop and restart the Initialization. You cannot access the logical drive until Initialization has finished.

Running Redundancy Check

Redundancy Check is a maintenance procedure for logical drives in fault-tolerant disk arrays that ensures all the data matches exactly. To run Redundancy Check:

1. From the Main Menu, highlight *Logical Drive Management* and press Enter.
2. Highlight the logical drive you want and press Enter.
3. Highlight *Background Activity* and press Enter.
4. Highlight *Start Redundancy Check* and press Enter.

   The redundancy check parameters appear.

   - **Auto Fix** – Corrects inconsistencies automatically
   - **Pause On Error** – Pauses the Redundancy Check when an error is found

   To change a parameter, highlight it and press the backspace toggle between *Yes* and *No*.
5. Highlight *Start* and press Enter.

   If necessary, you can pause and resume or stop and restart the Redundancy Check. You can use the logical drive while Redundancy Check is running.

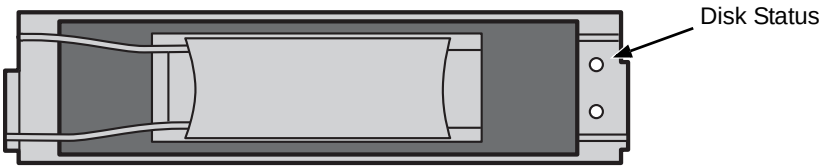
Locating a Logical Drive

This feature helps you identify the physical drives assigned to the logical drive you are working with in the CLU. To locate a logical drive:

1. From the Main Menu, highlight *Logical Drive Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *Locate Logical Drive* and press Enter.

   The disk status LEDs for the physical drives in this logical drive blink for one minute.

Figure 9. Disk Status LED



Managing the Network Connection

The network connection deals with the VessRAID's Management Port.

- Making Management Port Settings (below)

Making Management Port Settings

When you log into the VessRAID over your network, you use the VessRAID's management port.

Before you change settings, please see "Choosing DHCP or a Static IP Address" on page 26.

Making Automatic Settings

1. From the Main Menu, highlight *Network Management* and press Enter.
2. Highlight the management port and press Enter.
3. Highlight *NetMgmt Ethernet Port Settings* and press Enter
4. Highlight *DHCP* and press the spacebar to toggle to *Enabled*.
5. Press Ctrl-A to save your settings.

Making Manual Settings

1. From the Main Menu, highlight *Network Management* and press Enter.
2. Highlight the management port and press Enter.
3. Highlight *NetMgmt Ethernet Port Settings* and press Enter
4. Highlight *DHCP* and press the spacebar to toggle to *Disabled*.
5. Highlight each of the following and press the backspace key to erase the current value, then type the new value.
   - IP Address
   - Subnet Mask
   - Default Gateway IP Address
   - DNS Server IP Address
6. Press Ctrl-A to save your settings.

Managing SAS Connections

SAS connections deal with the VessRAID's two host data ports.

- Viewing SAS Port Information (page 166)
- Making SAS Port Settings (page 166)
- Viewing SAS Port Statistics (page 167)
- Viewing SAS Initiators (page 167)
- Adding a SAS Initiator (page 167)

Viewing SAS Port Information

There are two SAS data ports on the controller. To view information about the SAS ports:

1. From the Main Menu, highlight *SAS Management* and press Enter.
2. Highlight *SAS Ports* and press Enter.
3. Highlight the port you want to see and press Enter.

   The port information appears on the screen.

Adjustable Items

- Cable Signal Strength

See "Making SAS Port Settings" on page 166.

Making SAS Port Settings

There are two SAS data ports on the controller. To make settings to the SAS ports:

1. From the Main Menu, highlight *SAS Management* and press Enter.
2. Highlight *SAS Ports* and press Enter.
3. Highlight the port you want to see and press Enter.
4. Highlight *SAS Port Settings* and press Enter.
5. Highlight *Cable Signal Strength*, press the backspace key to erase the current value, then type in the new value.

   The range is 1 to 8. 1 is the default. Signal strength correlates to cable length in meters. Example: If you have a 2 m SAS cable, set signal strength to 2. If performance is unsatisfactory (see "Viewing SAS Port Statistics" on page 167), try settings of 1 and 3, then use the best setting for your system.
6. Press Ctrl-A to save your settings.

Viewing SAS Port Statistics

There are two SAS data ports on the controller. To view information about the SAS ports:

1. From the Main Menu, highlight *SAS Management* and press Enter.
2. Highlight *SAS Ports* and press Enter.
3. Highlight the port you want to see and press Enter.
4. Highlight *SAS Port Statistics* and press Enter.

   The statistics for the selected port appear on the screen.

Viewing SAS Initiators

There are two SAS data ports on the controller. To a view a list of initiators currently logged either of the SAS ports:

1. From the Main Menu, highlight *SAS Management* and press Enter.
2. Highlight *SAS Initiators* and press Enter.

   A list of all currently logged-in initiators appears on the screen.

Adding a SAS Initiator

You must add an initiator to the VessRAID's initiator list in order to use the initiator to create a LUN for your logical drive.

To add an initiator:

1. From the Main Menu, highlight *SAS Management* and press Enter.
2. Highlight *SAS Initiators* and press Enter.
3. Highlight the initiator you want to add and press the spacebar to choose it.
4. Highlight *Add Marked Initiators* and press Enter.

   The initiator is added to VessRAID's initiator list.

Managing Background Activity

Background activity refers to any of several functions that take place in the background while normal operation of the VessRAID continues.

Background activities work in conjunction with disk arrays and logical drives. See “Managing Disk Arrays” on page 148 and “Managing Logical Drives” on page 162 for more information about how and when to use background activities.

Background Activity Management includes the following functions:

- Viewing Current Background Activities (page 168)
- Making Background Activity Settings (page 168)

Viewing Current Background Activities

From the Main Menu, highlight *Background Activity* and press Enter. A count of current background activities appears, including:

- Rebuild
- PDM (Predictive Data Migration)
- Synchronization
- Redundancy Check
- Migration
- Transition
- Initialization
- Media Patrol

Making Background Activity Settings

1. From the Main Menu, highlight *Background Activity* and press Enter.
2. Highlight *Background Activity Settings* and press Enter.
3. Highlight following and press the spacebar to toggle between *Enabled* and *Disabled*.
    - **Media Patrol** – Checks the magnetic media on physical drives
    - **Auto Rebuild** – If there is a spare drive of adequate capacity, a critical disk array will begin to rebuild automatically. If not spare drive is available, the disk array will begin to rebuild as soon as you replace the failed physical drive with an unconfigured physical drive of equal or greater size.
4. Highlight following and press the spacebar to toggle through *Low*, *Medium*, and *High* rates:
    - **Rebuild** – Checks the data integrity on disk arrays
    - **Migration** – Change RAID level or add physical dries to disk arrays

- **PDM** – Looks for bad blocks on the physical drives of disk arrays
- **Transition** – Returns a revertible spare drive to spare status
- **Synchronization** – Checks the data integrity on disk arrays
- **Initialization** – Sets all data bits in the logical drive to zero
- **Redundancy Check** – Checks, reports and can correct data inconsistencies in logical drives

The rates are defined as follows:

- **Low** – Fewer resources to activity, more to data read/write.
- **Medium** – Balance of resources to activity and data read/write.
- **High** – More resources to activity, fewer to data read/write.

5. Highlight the following PDM trigger settings and press the backspace key to erase the current value:
   - **Reassigned Block Threshold** – 1 to 512 blocks
   - **Error Block Threshold** – 1 to 1024 blocks
6. Press Ctrl-A to save your settings.

Working with the Event Viewer

The Event Viewer displays log of subsystem events. Events are classified as:

- **Runtime Events** – A list of and information about the 1023 most recent runtime events recorded since the subsystem was started
- **NVRAM Events** – A list of and information about most important events over multiple subsystem startups. NVRAM events are stored in non-volatile memory

Working with the Event Viewer includes the following functions:

- Viewing Runtime Events (page 170)
- Clearing Runtime Events (page 170)
- Viewing NVRAM Events (page 170)
- Clearing NVRAM Events (page 171)

Viewing Runtime Events

To display Runtime Events:

1. From the Main Menu, highlight *Event Viewer* and press Enter.

   The log of Runtime Events appears. Events are added to the top of the list. Each item includes:

   - **Sequence number** – Begins with 0 at system startup.
   - **Device** – Disk Array, Logical Drive, Physical Drive by its ID number.
   - **Severity** – (lowest to highest) Information, Warning, Minor, Major, Critical and Fatal
   - **Timestamp** – Date and time the event happened.
   - **Description** – A description of the event in plain language.
2. Press the up and down arrow keys to scroll through the log.

Clearing Runtime Events

To clear the Runtime Event log:

1. From the Main Menu, highlight *Event Viewer* and press Enter.
2. Highlight *Clear Runtime Event Log* and press Enter.
3. Press Y to confirm.

Viewing NVRAM Events

This screen displays a list of and information about 63 most important events over multiple subsystem startups.

To display NVRAM events:

1. From the Main Menu, highlight *Event Viewer* and press Enter.
2. Highlight *NVRAM Events* and press Enter.

   The log of NVRAM Events appears. Events are added to the top of the list. Each item includes:

   - **Sequence number** – Begins with 0 at system startup.
   - **Device** – Disk Array, Logical Drive, Physical Drive by its ID number.
   - **Severity** – (lowest to highest) Information, Warning, Minor, Major, Critical and Fatal
   - **Timestamp** – Date and time the event happened.
   - **Description** – A description of the event in plain language.
3. Press the up and down arrow keys to scroll through the log.

Clearing NVRAM Events

To clear the Runtime Event log:

1. From the Main Menu, highlight *Event Viewer* and press Enter.
2. Highlight *NVRAM Events* and press Enter.
3. Highlight *Clear NVRAM Event Log* and press Enter.
4. Press Y to confirm.

Working with LUN Mapping

LUN Mapping includes the following functions:

- Viewing a List of Initiators (page 172)
- Enabling LUN Mapping (page 172)
- Creating an Initiator (page 172)
- Mapping a LUN to an Initiator (page 173)
- Deleting an Initiator (page 173)

Viewing a List of Initiators

LUN Mapping must be enabled in order for VessRAID to recognize a Fibre Channel or SAS initiator. To view a list of initiators:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *LUN Mapping* and press Enter.

   A list of the current initiators appears.

Enabling LUN Mapping

To enable LUN mapping:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *LUN Mapping* and press Enter.

   A list of the current Fibre Channel or SAS initiators appears.

LUN Mapping must be enabled in order for VessRAID to recognize the initiator. If LUN Mapping is currently disabled, highlight *Enable LUN Mapping* and press Enter.

Creating an Initiator

You must add an initiator to the VessRAID's initiator list in order to use the initiator to create a LUN. You can also add initiators under SAS Management, see page 167.

To create (add) a new initiator:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *LUN Mapping* and press Enter.
3. Highlight *Create New Initiator* and press Enter.
4. Type the name of the initiator.

A SAS initiator name is the SAS address of the HBA card in the Host PC.

Obtain the initiator name from the initiator utility on your host system.

Note that the initiator name you input must match exactly in order for the connection to work.

5. Press Ctrl-A to save the initiator.

Note

LUN Mapping must be enabled in order for VessRAID to recognize the initiator.

Mapping a LUN to an Initiator

You must add an initiator to the VessRAID's initiator list in order to use the initiator to create a LUN. You can add initiators under SAS Management, see page 167, or under "Creating an Initiator" on page 172.

To map a LUN to an initiator:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *LUN Mapping* and press Enter.
3. Highlight an existing Initiator and press Enter.

   A list of logical drives displays.
4. In the LUN field, press the backspace key to erase the current value, then type the LUN you want to assign to this initiator, from 0 to 255.

   If you make a error, press Ctrl-R to restore the current LUN.
5. Press Ctrl-A to save the LUN map.

Deleting an Initiator

To delete an initiator:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *LUN Mapping* and press Enter.
3. Highlight the initiator you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*) to the left of the listing.
4. Highlight *Delete Marked Initiators* and press Enter.
5. Press Y to confirm the deletion.

Managing UPS Units

Uninterruptible Power Supply (UPS) Management includes the following functions:

- Viewing a List of UPS Units (below)
- Making UPS Settings (page 175)
- Viewing UPS Information (page 176)

Viewing a List of UPS Units

To view a list of UPS units supporting the VessRAID:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *UPS Management* and press Enter.

   Information in the UPS List includes:

   - UPS ID – Click the ID number to view the UPS Tab.
   - Operational Status – OK means Normal.

     On AC means the UPS is connected to a viable external AC power source.

     On Battery means the external AC power source is offline and the UPS is running on battery power.
   - Model Name or Number
   - Capacity – Backup capacity expressed as a percentage.
   - Loading – Actual output of UPS as a percentage of the rated output. See the Note below.
   - Remaining Minutes – Number of minutes the UPS is expected to power your system in the event of a power failure.

Note

The maximum recommended Loading Ratio varies among models of UPS units. The general range is 60% to 80%. If the reported Loading Ratio exceeds the recommended value for your UPS unit:

- Have fewer subsystems or peripherals connected to this UPS unit.
- Add more UPS units, or use a higher-capacity UPS unit, to protect your RAID systems.

Making UPS Settings

These settings control how the VessRAID subsystem detects the UPS unit and responds to data reported by the UPS unit.

To make UPS settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *UPS Management* and press Enter.
3. Highlight *UPS Settings* and press Enter.
4. Perform the following actions as required:
    - Verify the Current UPS Communication method:
        - USB – USB connection.
        - Unknown – No connection.
    - Choose a Detection Setting from the dropdown menu:
        - Automatic – Default. If a UPS is detected when the subsystem boots, the setting changes to Enable.
        - Enable – Monitors UPS. Settings changes, reports warnings, and logs events.
        - Disable – Monitors UPS only.
    - Choose an Action Mode from the dropdown menu:
        - Shutdown - Shuts down the subsystem when a Threshold value is exceeded.
        - None – No additional action when Threshold value is exceeded.
    - Type values into the Threshold fields. See Note 1:
        - Running Time Remaining Threshold – Actual time below this value resets adaptive writeback cache to writethrough.
        - Warning Temperature Threshold – Actual temperature above this value triggers a warning and logs an event.
        - Loading Ratio Threshold – Actual loading ratio (percentage) above this threshold triggers a warning and logs an event. See Note 2.
        - Battery Charge Remaining Threshold – Reserve capacity below this percentage triggers a warning and logs an event.
5. Press Ctrl-A to save your settings.

Figure 1.

Notes

1. Detection Setting must be set to Auto. If a UPS is detected, the setting changes to Enable.
2. The maximum recommended Loading Ratio varies among models of UPS units. The general range is 60% to 80%.

Viewing UPS Information

To view information about a specific UPS unit:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *UPS Management* and press Enter.
3. Highlight the UPS unit you want and press Enter.

   UPS information includes:

   - Voltage Rating – Output voltage of the UPS.
   - Battery Capacity – Backup capacity expressed as a percentage.
   - Remaining Backup Time – Number of minutes the UPS is expected to power your system in the event of a power failure.
   - Loading Ratio – Actual output of UPS as a percentage of the rated output. See the Note below.

Note

The maximum recommended Loading Ratio varies among models of UPS units. The general range is 60% to 80%. If the reported Loading Ratio exceeds the recommended value for your UPS unit:

- Have fewer subsystems or peripherals connected to this UPS unit.
- Add more UPS units, or use a higher-capacity UPS unit, to protect your RAID systems.

Managing Users

User Management includes the following functions:

- Viewing User Information (page 177)
- Creating a User (page 177)
- Changing a User's Password (page 178)
- Changing a User's Display Name and Email Address (page 178)
- Changing a User's Privilege and Status (page 179)
- Deleting a User (page 179)

Viewing User Information

Each user types their user name and password to log into the CLI.

To view a list of current user accounts:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *User Management* and press Enter.

   A list of the current users appears.

Creating a User

To create a new user account:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *User Management* and press Enter.
3. Highlight *Create New User* and press Enter.
4. Highlight each field and type in the appropriate information:
   - User name (no spaces)
   - Password (Optional. Maximum 31 characters. Use letters, numbers, and underscore)
   - Display name (Optional)
5. Highlight *Privilege* and press the space bar to toggle though the options:

   For definitions of each privilege level, see the List of User Privileges below.
6. Highlight *Status* and press the space bar to toggle between the options:
   - **Enabled** – Allows the user to log in to the system
   - **Disabled** – Prevents the user from logging in to the system
7. Press Ctrl-A to save the user.

List of User Privileges

- **View** – Allows the user to see all status and settings but not to make any changes
- **Maintenance** – Allows the user to perform maintenance tasks including Rebuilding, PDM, Media Patrol, and Redundancy Check
- **Power** – Allows the user to create (but not delete) disk arrays and logical drives, change RAID levels, change stripe size; change settings of components such as disk arrays, logical drives, physical drives, and the controller.
- **Super** – Allows the user full access to all functions including create and delete users and changing the settings of other users, and delete disk arrays and logical drives. The default “administrator” account is a Super User.

Changing a User’s Password

Each user can change their own password. A Super user can change other user’s passwords. To change a user’s password:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *User Management* and press Enter.
3. Highlight a User in the list and press Enter.
4. Highlight *Change Password...* and press Enter.
5. Highlight *New Password* and type a password.

   Maximum 31 characters. Use letters, numbers, and underscore.
6. Highlight *Retype Password* and type the password again to verify.
7. Press Ctrl-A to save the password.

Changing a User’s Display Name and Email Address

Each user can change their display name and email address. To change a display name or email address:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *User Management* and press Enter.
3. Highlight a User in the list and press Enter.
4. Highlight *Display Name* and press Enter.
5. Highlight the items you want and press the backspace key to erase the current value, then type the new value:
   - User name
   - Email address

6. Press Ctrl-A to save the settings.

Changing a User's Privilege and Status

No user can change their own privilege or status. To change another user's privilege or status.

1. Log in as the Administrator or a Super user.
2. From the Main Menu, highlight *Additional Info and Management* and press Enter.
3. Highlight *User Management* and press Enter.
4. Highlight a User in the list and press Enter.
5. Highlight *Display Name* and press Enter.
6. Highlight *Privilege* and press the space bar to toggle though the options:

   For definitions of each privilege level, see "List of User Privileges" on page 178.
7. Highlight *Status* and press the space bar to toggle between the options:
   - **Enabled** – Allows the user to log in to the system
   - **Disabled** – Prevents the user from logging in to the system
8. Press Ctrl-A to save the settings.

Deleting a User

To delete a user:

1. Log in under a user name other than the one you want to delete.
2. From the Main Menu, highlight *Additional Info and Management* and press Enter.
3. Highlight *User Management* and press Enter.
4. Highlight the user you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*) to the left of the listing.
5. Highlight *Delete Marked Users* and press Enter.
6. Press Y to confirm the deletion.

Working with Software Management

Software Management includes the following functions:

- Making Email Settings (page 180)
- Making SLP Settings (page 181)
- Making Web Server Settings (page 181)
- Making Telnet Settings (page 182)
- Making SNMP Settings (page 182)
- Managing SNMP Trap Sinks (page 183)
- Making Netsend Settings (page 184)
- Managing Netsend Recipients (page 184)

Making Email Settings

By default, Email service is set to Automatic and its normal status is Started.

To make Email service settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *Email* and press Enter.
4. Highlight *Startup Type* and press the spacebar to toggle between *Automatic* and *Manual*.
5. Highlight the following and press the backspace key to erase the current value, then type the new value:
   - Server IP address
   - Server Port number (25 is the default)
6. Highlight *Authentication* and press the spacebar to toggle between *Yes* and *No*.

   If you selected Yes, type in a User name and Password in the fields provided.
7. The following items are optional but recommended. Highlight and press the backspace key to erase the current value, then type the new value:
   - Sender’s email address
   - Subject Line for the email message
8. Press Ctrl-A to save your settings.

To start, stop or restart the Email service, highlight *Start*, *Stop* or *Restart* and press Enter.

Making SLP Settings

By default, SLP service is set to Automatic and its normal status is Started.

To make SLP service settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *SLP* and press Enter.
4. Highlight *Startup Type* and press the spacebar to toggle between *Automatic* and *Manual*.
5. Press Ctrl-A to save your settings.

To start, stop or restart the SLP service, highlight *Start*, *Stop*, or *Restart* and press Enter.

Making Web Server Settings

By default, Web Server service is set to Automatic and its normal status is Started.

To make Web Server service settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *Web Server* and press Enter.
4. Highlight *Startup Type* and press the spacebar to toggle between *Automatic* and *Manual*.
5. Highlight the following and press the backspace key to erase the current value, then type the new value:
   - HTTP Port (80 is the default)
   - Session Time Out (24 minutes is the default. 1440 minutes = 24 hours)
6. Highlight *SSL* and press the spacebar to toggle between *Enabled* and *Disabled*.
7. Highlight *HTTPS Port* and press the backspace key to erase the current value, then type the new value. 443 is the default.
8. Press Ctrl-A to save your settings.

To start, stop or restart the Web Server service, highlight *Start*, *Stop*, or *Restart* and press Enter.

Making Telnet Settings

By default, Telnet service is set to Automatic and its normal status is Started. To make Telnet service settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *Telnet* and press Enter.
4. Highlight *Startup Type* and press the spacebar to toggle between *Automatic* and *Manual*.
5. Highlight the following and press the backspace key to erase the current value, then type the new value:
   - Port number (2300 is the default)
   - Session Time Out (24 minutes is the default. 1440 minutes = 24 hours)
   - Maximum number of connections (4 is the default)
6. Press Ctrl-A to save your settings.

To start, stop or restart the Telnet service, highlight *Start*, *Stop*, or *Restart* and press Enter.

Making SNMP Settings

By default, SNMP (Simple Network Management Protocol) service is set to Automatic and its normal status is Started.

To make SNMP service settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *SNMP* and press Enter.
4. Highlight *Startup Type* and press the spacebar to toggle between *Automatic* and *Manual*.
5. Highlight the following and press the backspace key to erase the current value, then type the new value:
   - **Port Number** – 161 is the default
   - **System Name** – (optional) Type a system name in this field
   - **System Location** – Type a country name in this field
   - **System Contact** – Type the email address of your system administrator in this field
   - **Read Community** – Type a community name in this field
   - **Write Community** – private (no change possible)

6. Press Ctrl-A to save your settings.

To start, stop or restart the SNMP service, highlight *Start*, *Stop*, or *Restart* and press Enter.

Managing SNMP Trap Sinks

Creating a SNMP trap sink

To create a trap sink:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *SNMP* and press Enter.
4. Highlight *Trap Sinks* and press Enter.

   A list of the current trap sinks appears.

Adding a trap sink

To add a trap sink:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *Create New Trap Sink* and press Enter
4. Highlight *Trap Sink IP address* and press the backspace key to erase the current value, then type the new IP address in this field.
5. Highlight *Trap Filter* and press the spacebar to toggle through the severity levels.

   The Severity Levels are (lowest to highest) Information, Warning, Minor, Major, Critical and Fatal.
6. Press Ctrl-A to save the Trap Sink.

Deleting a trap sink

To delete a trap sink:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight the trap sink you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*) to the left of the listing.
4. Highlight *Delete Marked Entries* and press Enter.

Making Netsend Settings

By default, Netsend service is set to Manual and its normal status is Stopped.

To make Netsend service settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *Netsend* and press Enter.
4. Highlight *Startup Type* and press the spacebar to toggle between *Automatic* and *Manual*.
5. Press Ctrl-A to save your settings.

To start, stop or restart the Netsend service, highlight *Start*, *Stop*, or *Restart* and press Enter.

Managing Netsend Recipients

Note that the Messenger service must be running on the recipient PC in order to receive reports.

Adding a recipient

To add a recipient:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
1. Highlight *Netsend* and press Enter.
2. Highlight *Message Recipient* and press Enter.
3. Highlight *Create New Message Recipient* and press Enter.
4. Type the recipient's IP address into the field provided.
5. Highlight *Message Event Severity Filter* and press the spacebar to change severity levels.

   The selected level and all higher severity levels of severity will be reported. Severity levels (from lowest to highest) are: Info, Warning, Minor, Major, Critical, and Fatal.
6. Press Ctrl-A to save your settings.

Changing Recipient Settings

To change recipient settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.

2. Highlight *Software Management* and press Enter.
1. Highlight the recipient whose settings you want to change and press Enter.
2. Type the recipient's IP address into the field provided.
3. Highlight *Message Event Severity Filter* and press the spacebar to change severity levels.
4. Press Ctrl-A to save your settings.

Deleting a Recipient

To delete a recipient:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
1. Highlight the recipient you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*) to the left of the listing
2. Highlight *Delete Marked Entries* and press Enter.

Netsend Requirements

In order to use Netsend:

- NetSend must be running the VessRAID
- You must provide the IP address for each recipient PC
- The Messenger service must be running on each recipient PC

If your Netsend and Messenger service settings are correct but the recipient PC does not receive event messages, check the recipient PC's Firewall settings. Refer to your OS documentation for more information.

Flashing through TFTP

See “Chapter 7: Maintenance” on page 219 for instructions.

Viewing Flash Image Information

Flash image information refers to the package of firmware components running on your VessRAID controller, including:

- Component name
- Version number
- Build date
- Flash (installation) date

To view flash image information:

1. From the Main Menu, highlight *Additional Info and Management*, and press Enter.
2. Highlight *Flash Image Version Info* and press Enter.

   The flash image information displays on the screen.

   Running Image Info – The firmware package currently running on the controllers

   Flashed Image Info – The firmware package flashed to memory

If the Running and Flashed Images do not match, the VessRAID has not restarted since the firmware was last updated. Restart the VessRAID to run the Flashed firmware package. See “Restarting the Subsystem” on page 191.

Note that all of these components are upgraded together in a package. See “Updating the Firmware in the CLU” on page 222.

Clearing Statistics

This function clears the statistical counts for the RAID controller, SAS ports, physical drives, and logical drives.

To clear statistics:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Clear Statistics* and press Enter.
3. Press Y to confirm the deletion.

Restoring Factory Defaults

This function restores the factory default settings to the firmware and software items you select.

Caution

Use this function with care. Do not restore to default settings for any item unless you are sure this action is needed.

To restore factory default settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Restore Factory Defaults* and press Enter.
3. Highlight the setting group you want and press the spacebar to toggle between *Yes* and *No*.

   Yes means this setting will be restored to the default value.
4. Highlight *Restore Factory Defaults* and press Enter.
5. Press Y to confirm the reset.

Shutting Down the Subsystem

There are two methods for shutting down the subsystem, depending on your connection. Choose the applicable procedure:

- Shutting down the VessRAID – Telnet Connection (page 188)
- Shutting down the VessRAID – Serial Connection (page 189)

Important

If you have a JBOD Expansion, always power off the RAID subsystem first. Then power off the JBOD subsystems.

Shutting down the VessRAID – Telnet Connection

This function enables you to shutdown the VessRAID subsystem on a Telnet connection. You can only do part of this procedure in the CLU. Additional action is required, as described below.

To shutdown the VessRAID:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Highlight *Shutdown or Restart* and press Enter.
4. Do one of the following actions:
   - Highlight *Option* and press the spacebar to display *Shutdown*.
   - Highlight *Option* and press the spacebar to display *Poweroff*.
5. Highlight *Submit* and press Enter.

   A warning message appears.
6. Press Y to continue.

   The screen goes blank.
7. Wait for no less than two minutes.
8. Do one of the following actions:
   - If you chose the *Shutdown* Option, manually turn off the power supply switch (both switches with redundant power supplies) on the back of the subsystem.
   - If you chose the *Poweroff* Option, the subsystem powers down automatically. On subsystems with redundant power supplies, unplug the power cords and plug them back in, to activate the power switches.

Caution

After you power off the subsystem, wait at least 10 seconds before you power on the subsystem again.

Shutting down the VessRAID – Serial Connection

This function enables you to shutdown the VessRAID subsystem on a serial connection. You can only do part of this procedure in the CLU. Additional action is required, as described below.

To shutdown the VessRAID:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Highlight *Shutdown or Restart* and press Enter.
4. Do one of the following actions:
   - Highlight *Option* and press the spacebar to display *Shutdown*.
   - Highlight *Option* and press the spacebar to display *Poweroff*.
5. Highlight *Submit* and press Enter.

   A warning message appears.
6. Press Y to continue.
7. When you see the following message:

   Shutdown complete. It is now safe to power off the subsystem.

   Do one of the following actions:
   - If you chose the *Shutdown* Option, manually turn off the power supply switch (both switches with redundant power supplies) on the back of the subsystem.
   - If you chose the *Poweroff* Option, the subsystem powers down automatically. On subsystems with redundant power supplies, unplug the power cords and plug them back in, to activate the power switches.

Caution

After you power off the subsystem, wait at least 10 seconds before you power on the subsystem again.

Starting Up After Shutdown

There are two methods for shutting down the subsystem. Choose one:

- Starting up the VessRAID – Telnet Connection (page 190)
- Starting up the VessRAID – Serial Connection (page 190)

Important

If you have a JBOD Expansion, always power on the JBOD subsystems first. Then power on the RAID subsystem.

Starting up the VessRAID – Telnet Connection

To start the RAID subsystem:

1. Manually turn on the power supply switches on the back of the subsystem.

   If the switches are ON but the subsystem is OFF, turn the switches off and on again.

   On subsystems with redundant power supplies, if the power switches do not respond, unplug the power cords and plug them back in. Try the power switches again.
2. Wait about two minutes.
3. Establish a Telnet connection to the VessRAID.

   See “Making a Telnet Connection” on page 131.

   If you cannot log in, wait 30 seconds and try again.
4. Type **menu** and press Enter to open the CLU.

Starting up the VessRAID – Serial Connection

To start the RAID subsystem:

1. Manually turn on the power supply switches on the back of the subsystem.

   If the switches are ON but the subsystem is OFF, turn the switches off and on again.

   On subsystems with redundant power supplies, if the power switches do not respond, unplug the power cords and plug them back in. Try the power switches again.
2. Wait about two minutes.
3. Establish a serial connection to the VessRAID.

   See “Making a Serial Connection” on page 130.

   When the **Login:** prompt appears, the start up is finished.
4. Type **menu** and press Enter to open the CLU.

Restarting the Subsystem

There are two methods for shutting down the subsystem, depending on your connection. Choose the applicable procedure:

- Restarting the Subsystem (page 191)
- Restarting VessRAID – Serial Connection (page 191)

Note

If you have a JBOD Expansion, you are not required to restart the JBOD subsystems when you restart the RAID subsystem.

Restarting VessRAID – Telnet Connection

This function enables you to restart the VessRAID subsystem on a Telnet connection. You can only do part of this procedure in the CLU. Additional action is required, as described below.

To restart the VessRAID:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Highlight *Option* and press the spacebar to display *Restart*.
4. Highlight *Submit* and press Enter.

   A warning message appears.
5. Press Y to continue.

   The screen goes blank.
6. Wait for no less than two minutes.
7. Re-establish your Telnet connection to the VessRAID CLU.

   If you cannot re-establish a connection, wait 30 seconds, then try again.

Restarting VessRAID – Serial Connection

This function enables you to restart the VessRAID subsystem on a serial connection. You can only do part of this procedure in the CLU. Additional action is required, as described below.

To restart the VessRAID:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Highlight *Option* and press the spacebar to display *Restart*.

4. Highlight *Submit* and press Enter.
   A warning message appears.
5. Press Y to continue.
   The screen will display shutdown and startup functions.
6. When the `Login:` prompt appears, log into the CLU again.

Making Buzzer Settings

This function enables the buzzer on the controller. When you first power-up the VessRAID, it beeps twice to show normal operation. To change buzzer settings:

1. From the Main Menu, highlight *Buzzer* and press Enter.

   A list of Controllers appears with the current buzzer setting and status.
2. Highlight the Controller whose buzzer you want to set and press Enter.
3. Highlight *Enabled* and press the spacebar to toggle between *Yes* and *No*.
4. Press Ctrl-A to save your settings.

The buzzer provides the audible alarm. See “VessRAID is Beeping” on page 265.

Chapter 6: Management with the LCD Panel

This chapter covers the following topics:

- Using the LCD Panel (below)
- Perusing the Interface (page 196)
- Managing the Network Connection (page 198)
- Managing SAS Connections (page 200)
- Managing the Controller (page 202)
- Managing Enclosures (page 203)
- Managing Physical Drives (page 204)
- Managing Disk Arrays (page 206)
- Managing Spare Drives (page 215)

Using the LCD Panel

The LCD panel is optional and typically installed during VessRAID installation. See page 11.

The LCD panel activates approximately 35 seconds after you switch on the VessRAID's power supply.

At first, the LCD screen displays `System is Initializing`.

When the VessRAID is fully booted and running under normal conditions, the LCD screen displays the VessRAID model number and IP address, as shown in Figure 1.

Figure 1. LCD default display

If the LCD panel displays *Check Event*, see "Chapter 9: Troubleshooting" on page 265 for more information on diagnosing the issue.

Perusing the Interface

- Making Mode Settings (page 196)
- Simple Mode (page 196)
- Advanced Mode (page 197)
- Limitations (page 197)
- Viewing Events (page 197)

Making Mode Settings

The LCD panel has two modes, Simple and Advanced. Simple is the default setting. The setting function toggles between Simple and Advanced mode.

To make LCD mode settings:

1. Press the ▲ or ▼ button until the display says *Misc. Management*.
2. Press the ↵ button and the display says *Buzzer Configure*.
3. Press the ▲ or ▼ button and the display says *Change Menu Mode.*
4. Press the ↵ button again and the display shows the current Mode setting on the top and the alternative mode setting on the bottom.
5. Press the ↵ button choose the alternative mode setting.

   The alternative LCD mode is set.

Simple Mode

Simple Mode enables you to perform the following enclosure and RAID management functions:

- **View Events** – View critical events, if any have been set
- **View Controller** – View IP address, MAC address, LCD UI version, Vendor name, WWN, memory size, and firmware version
- **Spare Drive Management** – View SD ID, physical drive ID number, capacity, revertible or not, global or dedicated, status; Locate spare drive
- **Misc. Management** – Buzzer setting, Menu mode setting
- **Management Port** – Link status up/down, DHCP enable/disable: Settings for subsystem IP address, Subnet Mask, Gateway IP, and DNS Server IP
- **SAS Management** – SAS Port link status, port type, link speed, SAS address, signal strength setting
- **Array Configure** – Automatic or Advanced Configuration. Advanced includes disk array, logical drive, and spare drive creation and deletion

Advanced Mode

Advanced Mode enables you to perform the Simple Mode functions, plus:

- **View Enclosure** – View overall enclosure status. Also view individual status of temperature, fan, power supply, and voltage
- **Physical Drive Management** – View PD ID, model, interface, capacity, location (enclosure and slot number), configuration (array and sequence number), firmware version, status; Locate physical drive
- **Logical Disk Management** – View LD ID, capacity, RAID level, write cache, stripe size, sector size, disk array ID, status; Locate logical drive

Limitations

The LCD panel does *not* perform these functions:

- Setting enclosure date and time
- Clearing a Stale or PFA condition from a physical drive
- Creating a *revertible* spare drive or a *dedicated* spare drive
- Running background activity, such as Media Patrol, PDM, Rebuild, or RAID level migration
- Viewing event logs
- Shutting down or restarting the VessRAID

Refer to “Chapter 4: Management with WebPAM PROe” on page 41 and “Chapter 5: Management with the CLU” on page 129 when you need to perform these functions.

Viewing Events

The LCD panel reports events with a severity of Warning, Minor, Major, Critical, or Fatal. See “Setting-up User Event Subscriptions” on page 61 for a description of the severity levels.

To view events:

1. Press the ▲ or ▼ button until the display says *View Events*.
2. Press the ↵ button and the display the first critical event.
   - Press the ↵ button to display more information about the event.
   - Press the ▲ or ▼ button to scroll through any additional events.

Managing the Network Connection

The network connection deals with the VessRAID's Management Port.

- Making Management Port Settings (below)

Making Management Port Settings

Manual IP Settings

To make Management Port settings manually:

1. Press the ▲ or ▼ button until the display says *Management Port*.
2. Press the ↵ button and the display says *Link Status Up*.

   If it says *Link Status Down*, reconnect to the network before preceding.
3. Press the ▲ or ▼ button and the display says *IP Address.*
4. Press the ↵ button to make a change.

   The current IP Address displays with the cursor under the first (extreme left) digit.
5. Press the ▲ button to increment and the ▼ button decrement.

   Press the ESC button to move left and the ↵ button move right.

   To set an IP address with double- or single-digit octets, for example, 192.168.1.50, type zeros as placeholders, **192.168.001.050**.

   After you have set the last (extreme right) digit, press the ↵ button.

   The current Subnet Mask displays with the cursor under the first (extreme left) digit.
6. Make the needed changes the same as in step 5.

   After you have set the last (extreme right) digit, press the ↵ button.

   The current Gateway displays with the cursor under the first (extreme left) digit.
7. Make the needed changes the same as in step 5.

   After you have set the last (extreme right) digit, press the ↵ button.

   The display says *Save Network Setting?*
8. Press the ↵ button to confirm.

   The display shows the new IP address you set.

Automatic IP Settings

To make Management Port settings automatically:

1. Press the ▲ or ▼ button until the display says *Management Port*.
2. Press the ↵ button and the display says *Link Status Up*.
   If it says *Link Status Down*, reconnect to the network before preceding.
3. Press the ▲ or ▼ button and the display says *DHCP Disable.*
4. Press the ↵ button to make a change.
5. Press the ↵ button to Enable.
6. Press the ↵ button to confirm.
   The display shows the new IP address set by the DHCP server.

Managing SAS Connections

SAS connections deal with the VessRAID's two host data ports.

- Viewing SAS Port Information (page 200)
- Making SAS Port Settings (page 200)

To add a SAS initiator, see "Adding an Initiator" on page 68 (WebPAM PROe) or page 167 (CLU).

Viewing SAS Port Information

The SAS Controller has one SAS channel. The SAS channel has two ports.

See "Making Data and Management Connections" on page 18 for information about how these ports are physically connected to the Host PC.

To view information about the SAS ports:

1. Press the ▲ or ▼ button until the display says *SAS Management*.
2. Press the ↵ button and the display says *SAS Port Info*.
3. Press the ↵ button again and the display says *SAS Port 1*.
   - Press the ↵ button again to see *SAS Port 1*.
   - Press ▼ button and the ↵ button to see *SAS Port 1.*

   If it says *Link Status Down*, reconnect to the network before preceding.
4. Press the ▲ or ▼ button to scroll through the port information.
   - Link Status
   - Port Type
   - Link Speed
   - SAS Address
   - Signal Strength

Making SAS Port Settings

The SAS Controller has one SAS channel. The SAS channel has two ports.

See "Making Data and Management Connections" on page 18 for information about how these ports are physically connected to the Host PC.

To make settings to the SAS ports:

1. Press the ▲ or ▼ button until the display says *SAS Management*.
2. Press the ↵ button and the display says *SAS Port Info*.
3. Press the ↵ button again and the display says *SAS Port 1*.
   - Press the ↵ button again to choose *SAS Port 1*.

- Press ▼ button and the ↵ button to choose *SAS Port 2.*

4. Press the ▲ or ▼ button to scroll to *Signal Strength.*
5. Press the ↵ button to highlight the current value.
6. Press the ▲ or ▼ button to increment or decrement the value.

   The range is 1 to 8. 1 is the default. Signal strength correlates to cable length in meters. Example: If you have a 2 m SAS cable, set signal strength to 2. If performance is unsatisfactory try settings of 1 and 3, then use the best setting for your system.
7. Press the ↵ button again to set the value.

Managing the Controller

The RAID controller is the heart of the VessRAID subsystem. To view Controller statistics or to make Controller settings, see “Managing the Controller” on page 86 (WebPAM PROe) or page 137 (CLU).

Viewing Controller Information

To view information about the controller:

1. Press the ▲ or ▼ button until the display says *View Controller*.
2. Press the ↵ button and the display says *Vendor*.
3. Press the ▲ or ▼ button to scroll through the list of items:
   - Vendor Name
   - WWN – World Wide Name
   - Memory Size
   - Firmware Version
   - IP Address
   - MAC Address
   - LCD UI Version

To change memory size or update the firmware, see “Chapter 7: Maintenance” on page 219.

To change the IP address, see “Managing the Network Connection” on page 198.

Managing Enclosures

The LCD panel provides information on the main VessRAID subsystem or *Head Unit* only. For a JBOD as well as other Enclosure functions, see “Managing Enclosures” on page 90 (WebPAM PROe) or page 140 (CLU).

Viewing the Enclosure

This function requires the LCD to be in Advanced mode. See page 196.

To view enclosure information:

1. Press the ▲ or ▼ button until the display says *View Enclosure*.
2. Press the ↵ button and the display says *Enclosure Status*.
3. Press the ↵ button again and the display says *Temperature Status*.

   This is the item list. It includes:

   - Temperature status
   - Fan status
   - Power Supply status
   - Voltage status
4. Press the ▲ or ▼ button to scroll through the list of items:
5. Press the ↵ button to display the reported value for the item. Then press the ESC button to return to the item list.

Making Buzzer Settings

The buzzer sounds to inform you that the VessRAID needs attention. See “VessRAID is Beeping” on page 265 for more information.

To make buzzer settings:

1. Press the ▲ or ▼ button until the display says *Misc. Management*.
2. Press the ↵ button and the display says *Buzzer Configure*.
3. Press the ↵ button again and the display shows the current Buzzer setting.
4. Press the ▲ or ▼ button to toggle between *Enable* and *Disable.*
5. Press the ↵ button make the new buzzer setting.
6. Press the ↵ button again to confirm.

Managing Physical Drives

These functions require the LCD panel to be in Advanced mode. See page 196. Managing physical drives with the LCD includes:

- Viewing Physical Drive Information (page 204)
- Locating a Physical Drive (page 204)

For other physical drive functions, see “Managing Physical Drives” on page 96 (WebPAM PROe) or page 145 (CLU).

Viewing Physical Drive Information

This function requires the LCD to be in Advanced mode. See page 196.

To view physical drive information:

1. Press the ▲ or ▼ button until the display says *Physical Drive Management*.
2. Press the ↵ button and the display a list of physical drives by ID number.
3. Press the ▲ or ▼ button to scroll through the list of physical drives.
4. Press the ↵ button choose a physical drive.
5. Press the ▲ or ▼ button to scroll through the list of items:
   - Model
   - Interface – SAS or SATA
   - Capacity
   - Location – Enclosure number and slot number
   - Configuration – Array number and sequence number or Spare
   - Firmware version
   - Status

Locating a Physical Drive

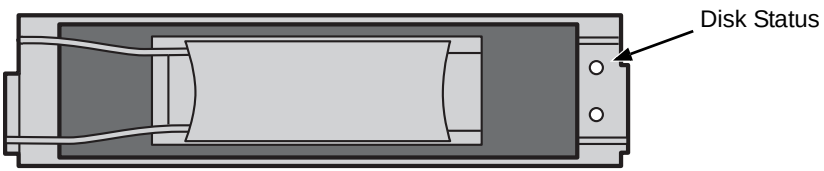
This function requires the LCD to be in Advanced mode. See page 196. This feature helps you identify a physical drive in the VessRAID enclosure.

To locate a physical drive:

1. Press the ▲ or ▼ button until the display says *Physical Drive Management*.
2. Press the ↵ button and the display a list of physical drives by ID number.
3. Press the ▲ or ▼ button to scroll through the list of physical drives:
4. Press the ↵ button choose a physical drive.
5. Press the ▲ or ▼ button until the display says *Locate Physical Drive*.

6. Press the ↵ button. The disk status LED for the physical drive blinks for one minute. See Figure 2.

Figure 2. Disk Status LED



Managing Disk Arrays

Disk Array Management in the LCD includes the following functions:

- Creating a Disk Array – Automatic (page 206)
- Creating a Disk Array – Advanced (page 207)
- Deleting a Disk Array (page 209)
- Viewing Disk Array Information (page 209)
- Locating a a Disk Array (page 210)
- Creating a Logical Drive (page 211)
- Deleting a Logical Drive (page 212)
- Viewing Logical Drive Information (page 213)
- Locating a a Logical Drive (page 214)

For other disk array functions, see “Managing Disk Arrays” on page 105 (WebPAM PROe) or page 148 (CLU).

For other logical drive functions, see “Managing Logical Drives” on page 118 (WebPAM PROe) or page 162 (CLU).

Creating a Disk Array – Automatic

The Disk Array Automatic Creation option enables you to create a new disk array following a default set of parameters. One logical drive will be made automatically when you create the disk array.

If you have multiple enclosures, a separate disk array and logical drive set will be created for each enclosure.

If you have both Hard Disk Drives (HDD) and Solid State Drives (SSD), separate disk array and logical drive sets will be created for your HDDs and for your SSDs. These two drive types cannot be mixed in the same disk array.

Creating

To create a disk array automatically:

1. Press the ▲ or ▼ button until the display says *Array Configure*.
2. Press the ↵ button and the display says *Auto Configure*.
3. Press the ↵ button again and the display says *Are you sure?*
4. Press the ▼ button so the display says *Yes.*
5. Press the ↵ button to input your answer.
6. Press the ↵ button again to confirm.

   The display shows the array, logical drive, and spare drive creation process.

Verifying

To verify the results of the automatic disk array creation:

1. From the default screen, press the ▲ or ▼ button until the display says *Logical Disk Management*.
2. Press the ↵ button and the display says *000*.
3. Press the ↵ button again to choose this logical drive.
4. From the default screen, press the ▲ or ▼ buttons to scroll through the information for the logical drive.

Creating a Disk Array – Advanced

Creating a Disk Array

For more information on the choices below, see “Chapter 8: Technology Background” on page 233.

To create a disk array:

1. Press the ▲ or ▼ button until the display says *Array Configure*.
2. Press the ↵ button and the display says *Auto Configure*.
3. Press the ▲ or ▼ button until the display says *Advanced Configure*.
4. Press the ↵ button and the display says *Disk Array Create.*
5. Press the ↵ button again and the display says *Physical Drive Select.*
6. Press the ↵ button again to display the available physical drives by number.
7. Press the ▼ button to move through the list. Press the ↵ button to choose a physical drive for your array.

   Note that you cannot mix HDDs and SSDs in the same disk array.
8. Press the ▼ button to move to END and press the ↵ button to input your choices.
9. Press the ↵ button again to confirm.

   The display shows the array creation process. When the creation is finished, the LCD returns to *Disk Array Create*.

Creating a Logical Drive

For more information on the choices below, see “Chapter 8: Technology Background” on page 233.

To create a logical drive on your new disk array:

1. Press the ↵ button and the display says *Logical Disk Create.*

2. Press the ↵ button again and the display says *000.*
3. Press the ↵ button again and the display says *RAID Level.*
4. Press the ▲ or ▼ button until the display shows the RAID level you want.

   Note that the available RAID levels depend on the number of physical drives in your disk array.
5. Press the ↵ button to choose the RAID level shown on the screen.

   The display shows the maximum available capacity.
6. Press the ▲ or ▼ button until the display shows the capacity you want.
7. Press the ↵ button to choose the capacity shown on the screen.

   The display shows the default stripe size.

   The choices are *64 KB*, *128 KB*, *256 KB*, *512 KB*, and *1 MB.*
8. Press the ▲ or ▼ button until the display shows the stripe size you want.
9. Press the ↵ button to choose the stripe size shown on the screen.

   The display shows the default sector size.

   The choices are *512 B*; *1 KB*, *2 KB*, and *4 KB*
10. Press the ▲ or ▼ button until the display shows the sector size you want.

    The display shows the default read policy.

    The choices are *ReadCache*, *ReadAhead* and *None*.
11. Press the ▲ or ▼ button until the display shows the read policy you want.
12. Press the ↵ button to choose the read policy shown on the screen.

    The display shows the default write policy.

    The choices are *WriteBack* and *WriteThru* (write though).
13. Press the ▲ or ▼ button until the display shows the write policy you want.
14. Press the ↵ button to choose the write policy shown on the screen.
15. Press the ↵ button again to confirm.

    The display shows the logical drive creation process. When the creation is finished, the LCD returns to *Logical Disk Create*.

Creating a Spare Drive

This function creates a non-revertible, global spare drive. If you want a revertible or a dedicated spare drive, see “Creating a Spare Drive” on page 125 or page 159.

To create a spare drive for your new disk array:

1. Press the ↵ button and the display says *Spare Drive Create.*

2. Press the ↵ button again to display the available physical drives by number.
3. Press the ▼ button to move through the list. Press the ↵ button to choose a physical drive for your spare drive.

   Note that your spare drive must be the same type of drive, HDD or SSD, as the drives in your disk array.
4. Press the ↵ button again to confirm.

   The display shows the spare drive creation process. When the creation is finished, the LCD returns to *Spare Drive Create*.

Deleting a Disk Array

Caution

When you delete a disk array, you delete all the logical drives and the data they contain. Back up all important data before deleting a disk array.

To delete a disk array:

1. Press the ▲ or ▼ button until the display says *Array Configure*.
2. Press the ↵ button and the display says *Auto Configure*.
3. Press the ▲ or ▼ button until the display says *Advanced Configure*.
4. Press the ▲ or ▼ button until the display says *Disk Array Delete.*
5. Press the ↵ button again to display a list of disk arrays.
6. Press the ▲ or ▼ button choose a disk array for deletion.
7. Press the ↵ button and the display says *Delete Disk Array X?*
8. Press the ↵ button again and the display says *Are you sure? NO.*
9. Press the ▼ button to change the answer to *Y*ES, then press the ↵ button.
10. Press the ↵ button again to confirm.

    The chosen disk array is deleted.

Viewing Disk Array Information

To view disk array information:

1. Press the ▲ or ▼ button until the display says *Disk Array Management*.
2. Press the ↵ button and the display a list of disk arrays by ID number.
3. Press the ▲ or ▼ button to scroll through the list of disk arrays.

4. Press the ↵ button choose a disk array.
5. Press the ▲ or ▼ button to scroll through the list of items:
   - ID Number
   - Configured Capacity
   - Free Capacity
   - Number of Physical Drives*
   - Number of Logical Drives*
   - Status

   * Press the ↵ button to view physical drive or logical drive information from this point.

Disk Array Status

- **OK** – The normal state of a disk array. For RAID Levels other than RAID 0 (Striping), the disk array has full redundancy.
- **Synchronizing** – When you first create a disk array, the disk array synchronizes. During that time, your data is available. However, access will be slower until synchronizing is done.
- **Critical/Degraded** – This condition results from a physical drive failure. Your data is still available. However, the disk array has lost redundancy (fault tolerance). You must determine the cause of the problem and correct it. See “Critical & Offline Disk Arrays” on page 290.
- **Rebuilding** – This condition is temporary. When a physical drive has been replaced, the disk array automatically begins rebuilding in order to restore redundancy (fault tolerance). Your data is still available. However, access will be slower until rebuilding is done.
- **Transport Ready** – This function is not supported in the LCD panel. See “Preparing a Disk Array for Transport” on page 117 (WebPAM PROe) or page 154 (CLU).

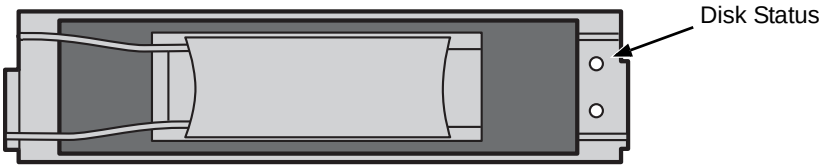
Locating a a Disk Array

This feature helps you identify the physical drives assigned to the disk array you are working with in the LCD panel. To locate a disk array:

1. Press the ▲ or ▼ button until the display says *Physical Drive Management*.
2. Press the ↵ button to display a list of disk arrays by ID number.
3. Press the ▲ or ▼ button to scroll through the list of disk arrays.
4. Press the ↵ button choose a disk array.
5. Press the ▲ or ▼ button until the display says *Locate Disk Array*.

6. Press the ↵ button. The disk status LEDs for the physical drives in the disk array blink for one minute. See Figure 3.

Figure 3. Disk Status LED



Creating a Logical Drive

You can create logical drives on existing disk arrays if there is available space in the array. For more information on the choices below, see “Chapter 8: Technology Background” on page 233.

To create a logical drive from an existing disk array:

1. To Press the ▲ or ▼ button until the display says *Array Configure*.
2. Press the ↵ button and the display says *Auto Configure*.
3. Press the ▲ or ▼ button until the display says *Advanced Configure*.
4. Press the ▲ or ▼ button until the display says *Logical Disk Create.*
5. Press the ↵ button again and the display says *000.*
6. Press the ↵ button again and the display says *RAID Level.*
7. Press the ▲ or ▼ button until the display shows the RAID level you want.

   Note that the available RAID levels depend on the number of physical drives in your disk array.
8. Press the ↵ button to choose the RAID level shown on the screen.

   The display shows the maximum available capacity.
9. Press the ▲ or ▼ button until the display shows the capacity you want.
10. Press the ↵ button to choose the capacity shown on the screen.

    The display shows the default stripe size.

    The choices are *64 KB*, *128 KB*, *256 KB*, *512 KB*, and *1 MB.*
11. Press the ▲ or ▼ button until the display shows the stripe size you want.
12. Press the ↵ button to choose the stripe size shown on the screen.

    The display shows the default sector size.

    The choices are *512 B*; *1 KB*, *2 KB*, and *4 KB*
13. Press the ▲ or ▼ button until the display shows the sector size you want.

The display shows the default read policy.

The choices are *ReadCache*, *ReadAhead* and *None*.

14. Press the ▲ or ▼ button until the display shows the read policy you want.
15. Press the ↵ button to choose the read policy shown on the screen.

    The display shows the default write policy.

    The choices are *WriteBack* and *WriteThru* (write though).
16. Press the ▲ or ▼ button until the display shows the write policy you want.
17. Press the ↵ button to choose the write policy shown on the screen.
18. Press the ↵ button again to confirm.

    The display shows the logical drive creation process. When the creation is finished, the LCD returns to *Logical Disk Create*.

Deleting a Logical Drive

Caution

When you delete a logical drive, you delete all the data it contains. Back up all important data before deleting a logical drive.

To delete a logical drive from a disk array:

1. Press the ▲ or ▼ button until the display says *Array Configure*.
2. Press the ↵ button and the display says *Auto Configure*.
3. Press the ▲ or ▼ button until the display says *Advanced Configure*.
4. Press the ▲ or ▼ button until the display says *Logical Drive Delete.*
5. Press the ↵ button again to display a list of logical drives.
6. Press the ▲ or ▼ button choose a logical drive for deletion.
7. Press the ↵ button and the display says *Delete Logical Drive X?*
8. Press the ↵ button again and the display says *Are you sure? NO.*
9. Press the ▼ button to change the answer to *Y*ES, then press the ↵ button.
10. Press the ↵ button again to confirm.

    The chosen logical drive is deleted.

Viewing Logical Drive Information

This function requires the LCD to be in Advanced mode. See page 196.

To view logical drive information:

1. Press the ▲ or ▼ button until the display says *Logical Disk Management*.
2. Press the ↵ button and the display a list of logical drives by ID number.
3. Press the ▲ or ▼ button to scroll through the list of logical drives.
4. Press the ↵ button choose a logical drive.
5. Press the ▲ or ▼ button to scroll through the list of items:
    - Logical Drive ID Number
    - Capacity
    - RAID Level
    - Write Cache
    - Stripe Size
    - Sector Size
    - Disk Array ID Number
    - Status

Logical Drive Status

- **OK** – The normal state of a logical drive. For RAID Levels other than RAID 0 (Striping), the logical drive has full redundancy.
- **Synchronizing** – When you first create a logical drive, the logical drive synchronizes. During that time, your data is available. However, access will be slower until synchronizing is done.
- **Rebuilding** – This condition is temporary. When a physical drive has been replaced, the logical drive automatically begins rebuilding in order to restore redundancy (fault tolerance). Your data is still available. However, access will be slower until rebuilding is done.
- **Critical** – This condition results from a physical drive failure. Your data is still available. However, the logical drive has lost redundancy (fault tolerance). You must determine the cause of the problem and correct it. See “Critical & Offline Disk Arrays” on page 290.
- **Offline** – This condition arises as the result of a second physical drive failure. An Offline logical drive is not accessible but some or all of your data may remain intact. You must determine the cause of the problem and correct it. See “Critical & Offline Disk Arrays” on page 290.
- **Transport Ready** – This function is not supported in the LCD panel. See “Preparing a Disk Array for Transport” on page 117 (WebPAM PROe) or page 154 (CLU).

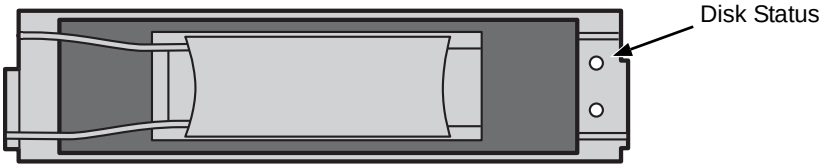
Locating a a Logical Drive

This function requires the LCD to be in Advanced mode. See page 196. This feature helps you identify the physical drives assigned to the logical drive.

To locate a logical drive:

1. Press the ▲ or ▼ button until the display says *Logical Disk Management*.
2. Press the ↵ button to display a list of logical drives by ID number.
3. Press the ▲ or ▼ button to scroll through the list of logical drives.
4. Press the ↵ button choose a logical drive.
5. Press the ▲ or ▼ button until the display says *Locate Logical Drive*.
6. Press the ↵ button. The disk status LEDs for the physical drives in the logical drive blink for one minute. See Figure 4.

Figure 4. Disk Status LED



Managing Spare Drives

Spare Drive Management on the LCD includes:

- Viewing Spare Drive Information (page 215)
- Creating a Spare Drive (page 215)
- Deleting a Spare Drive (page 216)
- Locating a Spare Drive (page 216)

For other spare drive functions, see “Managing Spare Drives” on page 124 or “Managing Spare Drives” on page 159.

Viewing Spare Drive Information

To view spare drive information:

1. Press the ▲ or ▼ button until the display says *Spare Drive Management*.
2. Press the ↵ button and the display a list of spare drives by ID number.
3. Press the ▲ or ▼ button to scroll through the list of spare drives.
4. Press the ↵ button choose a spare drive.
5. Press the ▲ or ▼ button to scroll through the list of items:
   - Spare Drive ID Number
   - Physical Drive ID Number*
   - Capacity
   - Revertible – See “Transition” on page 261 for more information.
   - Type – Global (all disk arrays) or Dedicated (to specified disk arrays)
   - Status

   * Press the ↵ button to view physical drive information from this point.

Spare Drive Status

- **OK** – The normal state of a spare drive.
- **Offline** – Not available for use as a spare. Requires corrective action. See “Physical Drive Problems” on page 294.

Other status conditions involve functions not supported by the LCD panel.

Creating a Spare Drive

Only unconfigured physical drives can be used to make spares. The spare drive must be the same type of drive, HDD or SSD, as the other drives in disk array.

To create a spare drive:

1. Press the ▲ or ▼ button until the display says *Array Configure*.

2. Press the ↵ button and the display says *Auto Configure*.
3. Press the ▲ or ▼ button until the display says *Advanced Configure*.
4. Press the ▲ or ▼ button until the display says *Spare Drive Create.*
5. Press the ↵ button again to display a list of unconfigured physical drives.
6. Press the ▲ or ▼ button to move through the list. Press the ↵ button to choose a physical drive for your spare drive.

   To create a dedicated or revertible spare drive, see “Creating a Spare Drive” on page 125 (WebPAM PROe) or page 159 (CLU).

Deleting a Spare Drive

Caution

If the spare drive you delete is the only spare, the controller will not rebuild a critical array until you provide a new spare drive.

To delete a spare drive:

1. Press the ▲ or ▼ button until the display says *Array Configure*.
2. Press the ↵ button and the display says *Auto Configure*.
3. Press the ▲ or ▼ button until the display says *Advanced Configure*.
4. Press the ▲ or ▼ button until the display says *Spare Drive Delete.*
5. Press the ↵ button again to display a list of spare drives.
6. Press the ▲ or ▼ button to choose the spare drive to delete.
7. Press the ↵ button and the display says *Are you sure? NO.*
8. Press the ▼ button to change the answer to *Y*ES, then press the ↵ button.
9. Press the ↵ button again to confirm.

   The chosen spare drive is deleted.

Locating a Spare Drive

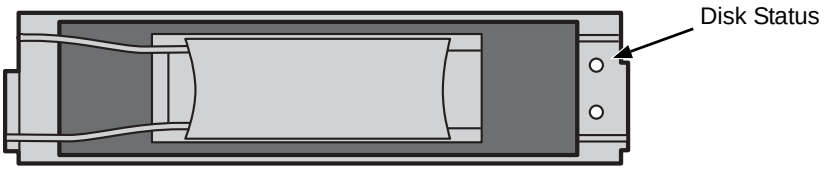
This feature helps you identify the physical drive assigned as a spare drive.

To locate a spare drive:

1. Press the ▲ or ▼ button until the display says *Spare Drive Management*.
2. Press the ↵ button and the display a list of spare drives by ID number.
3. Press the ▲ or ▼ button to scroll through the list of spare drives:

4. Press the ↵ button choose a spare drive.
5. Press the ▲ or ▼ button until the display says *Locate Spare Drive*.
6. Press the ↵ button. The disk status LED for the physical drive blinks for one minute. See Figure 5.

Figure 5. Disk Status LED



Chapter 7: Maintenance

This chapter covers the following topics:

- Updating the Firmware in WebPAM PROe (below)
- Updating the Firmware in the CLU (page 222)
- Replacing a Power Supply (page 224)
- Replacing a RAID Controller (page 225)
- Replacing a Cooling Fan (page 226)
- Replacing the Cache Battery (page 228)
- Replacing the Memory Module (page 230)

Updating the Firmware in WebPAM PROe

A firmware update consists of the following actions:

- Downloading the Firmware Image File (page 219)
- Updating the Firmware from one of these sources:
  - TFTP Server (page 219)
  - The Host PC or Server (page 220)
- Restarting the Subsystem (page 221)

Downloading the Firmware Image File

Go to the Promise website at http://www.promise.com/support/support_eng.asp and download the latest firmware image (.img) file to your TFTP server or your PC. The firmware update image file includes all of the files for the VessRAID, including:

- Redboot ROM
- Kernel
- Firmware
- Software
- Ramdisk
- SEP Firmware
- OEM Customization
- Other files

Updating Firmware from TFTP Server

To update the firmware from a TFTP server:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Software Management icon.
4. Click the **Firmware Update** tab.

5. Do one of the following actions:
   - Click the **Download from TFTP Server** option, then click the **Next** button.
   - From the Firmware Update tab dropdown menu, choose *Download from TFTP Server*.
6. Enter the hostname or IP address of your TFTP server in the field provided.
7. Enter the port number of your TFTP server in the field provided (69 is the default).
8. Enter the filename of the Firmware Update file in the field provided.
9. Click the **Submit** button.
10. When the download is completed, click the **Next** button.

    A popup message appears warning you not to reboot the VessRAID during the firmware update procedure.
11. In the popup message, click the **OK** button.

    The update progress displays. Then a popup message appears to tell you to reboot the VessRAID.
12. In the popup message, click the **OK** button.
13. Restart the VessRAID. See “Restarting the Subsystem” on page 221.

Note

After you click the **Submit** button, if WebPAM PROe displays this message: **error transferring image**, you entered an incorrect file name or an incorrect location. Check the information and try again.

Updating Firmware from your PC

To update the firmware from your PC:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Software Management icon.
4. Click the **Firmware Update** tab.
5. Do one of the following actions:
   - Click the **Download Flash File from Local File through HTTP** option, then click the **Next** button.
   - From the Firmware Update tab dropdown menu, choose *Download from Local File*.

6. Enter the filename of the Firmware Update file in the field provided.

   Or, click the **Browse...** button and choose the Firmware Update file in the Open dialog box.
7. Click the **Submit** button.
8. When the download is completed, click the **Next** button.

   A popup message appears to warn you not to reboot the VessRAID during the firmware update procedure.
9. In the popup message, click the **OK** button.

   The update progress displays. Then a popup message appears to tell you to reboot the VessRAID.
10. In the popup message, click the **OK** button.
11. Restart the VessRAID. See “Restarting the Subsystem” on page 221.

Note

After you click the **Submit** button, if WebPAM PROe displays this message: **error transferring image**, you entered an incorrect file name or an incorrect location. Check the information and try again.

Restarting the Subsystem

Warning

Do not restart the VessRAID during a firmware upgrade procedure. Wait until the upgrade is done and you are prompted to restart.

To restart the VessRAID subsystem:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Shutdown** link in Management View.

   A Shutdown or Restart tab will appear.
4. On the Shutdown or Restart tab, choose *Restart* from the dropdown menu.
5. Click the **Submit** button.
6. In the warning box, click the **OK** button.
7. In the confirmation box, type the word **confirm** in the field provided.
8. Click the **OK** button.

When the controller shuts down, your WebPAM PROe connection will be lost.

9. Wait for two to three minutes.
10. In your browser, log into WebPAM PROe once again.

    If you cannot log in, wait for 30 seconds, and try again. Repeat until login is successful.

Updating the Firmware in the CLU

A firmware update consists of the following actions:

- Downloading the Firmware Image File (page 222)
- Updating the Firmware (page 222)
- Restarting Subsystem over a Telnet Connection (page 223)
- Restarting Subsystem over a Serial Connection (page 223)

Downloading the Firmware Image File

Go to the Promise website at http://www.promise.com/support/support_eng.asp and download the latest firmware image file to your TFTP server.

Updating the Firmware

To update the firmware file in the CLU:

1. From the Main Menu, highlight *Additional Info and Management*, and press Enter.
2. Highlight *Flash through TFTP* and press Enter.
3. Highlight *TFTP Server* and type the IP address of your TFTP server in the field provided.
4. Highlight *Port Number* and press the backspace key to erase the current value, then type the new value. 69 is the default.

   A list of the current users appears.
5. Highlight *File Name* and type the file name of the firmware image file in the field provided.
6. Highlight *Start* and press Enter.

   A message appears to tell you to reboot the VessRAID.
7. Restart the VessRAID.

   See “Restarting Subsystem over a Telnet Connection” on page 223 or “Restarting Subsystem over a Serial Connection” on page 223.

Restarting Subsystem over a Telnet Connection

Warning

Do not restart the VessRAID during a firmware upgrade procedure. Wait until the upgrade is done and you are prompted to restart.

To restart the VessRAID subsystem on a Telnet connection:

1. From the Main Menu, highlight *Additional Info and Management*, and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Press the spacebar to display *Restart* then press Enter.

   A warning message appears.
4. Press Y to continue.

   The screen will go blank.
5. Wait for two to three minutes.
6. Re-establish your Telnet connection to the VessRAID CLU.

   If you cannot re-establish a connection, wait 30 seconds, then try again.

Restarting Subsystem over a Serial Connection

Warning

Do not restart the VessRAID during a firmware upgrade procedure. Wait until the upgrade is one and you are prompted to restart.

To restart the VessRAID subsystem on a serial connection:

1. From the Main Menu, highlight *Additional Info and Management*, and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Press the spacebar to display *Restart* then press Enter.

   A warning message appears.
4. Press Y to continue.

   The screen will display shutdown and startup functions.
5. When the `Login:` prompt appears, log into the CLU again.

Replacing a Power Supply

VessRAID 1700s Series

The power supply on the VessRAID 1700s Series is not replaceable onsite. If you need to replace the power supply, contact Technical Support and make arrangements to return the subsystem to Promise for service. See page 305.

VessRAID 1800s Series

The redundant power supplies on the VessRAID 1800s Series are designed as field-replaceable units. You can replace a power supply without removing the VessRAID from the rack.

Removing the old power supply

To remove the power supply:

1. Verify that the power supply LED is amber or red.
2. Switch off the power to the power supply you plan to replace.
3. Unplug the power cord.
4. Loosen and remove the retaining screw on the left side of the power supply.
5. Pull the power supply out of the VessRAID enclosure.

Installing the new power supply

To install the power supply:

1. Carefully slide the power supply into the enclosure.
2. Install and tighten the retaining screw on the left side of the power supply.
3. Plug in the power cord.
4. Switch on the power supply.
5. Verify that the new power supply LED is green.

This completes the power supply replacement procedure.

Replacing a RAID Controller

The RAID Controller monitors and manages the logical drives. When the controller is replaced, all of your logical drive data and configurations remain intact because this logical drive information is stored on the disk drives.

RAID Controller failure is rare. But you might have to remove and reinstall the same RAID Controller in order to replace a cooling fan, cache battery, or memory module as described in this chapter.

Caution

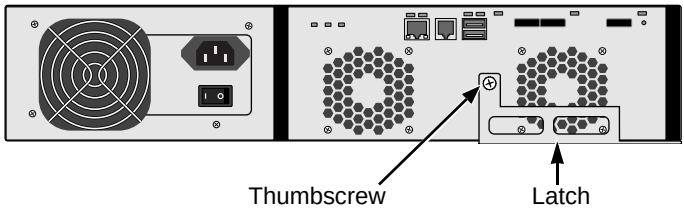
- Do not replace the RAID Controller based on LED colors alone. Only replace the RAID Controller when directed to do so by Promise Technical Support. See page 305.
- Only a qualified technician should perform this procedure.
- You must shut down the VessRAID subsystem before you can perform this procedure.

Removing the old controller

To replace the RAID Controller:

1. Shut down the VessRAID. See “Shutting Down the Subsystem” on page 82 or page 188.
2. On the RAID Controller, loosen the thumbscrew, swing the latch to the right and pull the RAID Controller out of the enclosure.
3. Disconnect the SAS, Ethernet, serial, and power cables.
4. On the RAID Controller, loosen the thumbscrew, swing the latch to the right and pull the RAID Controller out of the enclosure. See Figure 1.

Figure 1. Removing the RAID Controller



Installing the new controller

1. Verify that the new RAID Controller has a cache battery and memory module installed.

   If it does not have these items, transfer them from the old RAID Controller.

See page 228 and page 230 for more information.

2. Carefully slide the new RAID Controller into the enclosure.
3. Swing the latch to the left and secure it with the thumbscrew.
4. Reconnect the SAS, Ethernet, serial, and power cables.
5. Switch on the power.

   The VessRAID restarts. For more information about VessRAID's start-up behavior, see "Connecting the Power" on page 21.

This completes the RAID Controller replacement procedure.

Replacing a Cooling Fan

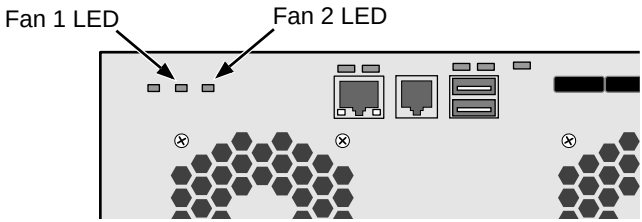
Cautions

- Only a qualified technician should perform this procedure.
- You must shut down the VessRAID subsystem before you can perform this procedure.

To replace a fan:

1. Verify that the Fan LED on the cooling unit is amber or red. See Figure 2.

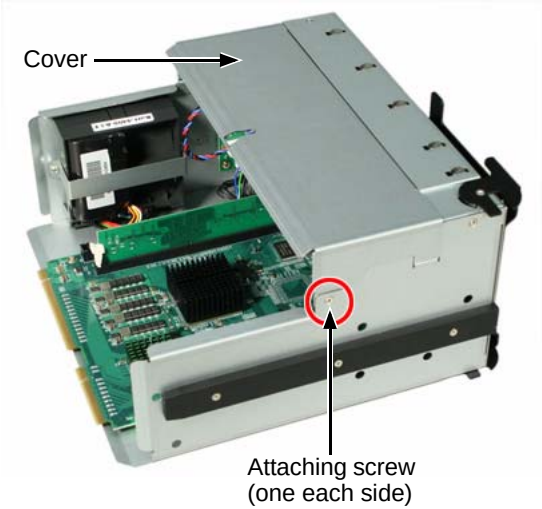
Figure 2. Fan LEDs



2. Shut down the VessRAID and remove the RAID Controller.

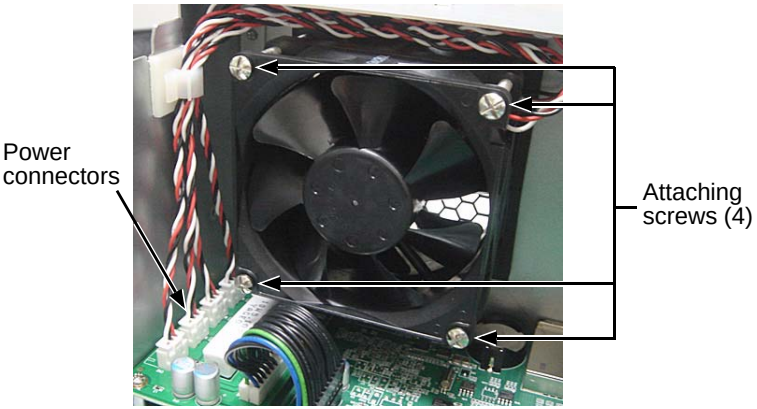
   See "Replacing a RAID Controller" on page 225.
3. Lay the RAID Controller on a non-static surface and remove the cover attaching screws, one on each side, then remove the cover.

Figure 3. RAID Controller cover and attaching screw



4. Remove the four attaching screws. See Figure 4.
5. Detach the fan's power connector and lift the old fan out of the controller.

Figure 4. RAID Controller cooling fan



6. Place a new fan in the controller, attach the power connector, and install the four attaching screws.
7. Attach the RAID Controller cover and install the two attaching screws.

   See Figure 3.

8. Reinstall the RAID Controller.

   See “Replacing a RAID Controller” on page 225.

This completes the fan replacement procedure.

Replacing the Cache Battery

The cache battery, or Battery Backup Unit (BBU), is located inside the RAID Controller. The battery assembly is replaced as a unit.

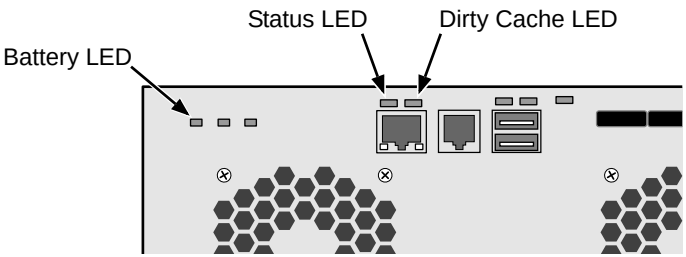
Cautions

- Try reconditioning the battery before you replace it. See page 94 or page 143 for more information.
- If power service has failed, do not remove the RAID Controller if the Dirty Cache LED is lighted. See Figure 5. Wait until power service is restored.
- Only a qualified technician should perform this procedure.
- You must shut down the VessRAID subsystem before you can perform this procedure.
- Installing the wrong replacement battery can result in an explosion.
- Dispose of used batteries according to the instructions that come with the battery.

To replace the cache battery:

1. Verify that the Battery LED is amber or red. See Figure 5.

Figure 5. VessRAID enclosure LEDs



2. Shut down the VessRAID. See “Shutting Down the Subsystem” on page 82 or page 188.
3. Remove the RAID Controller.

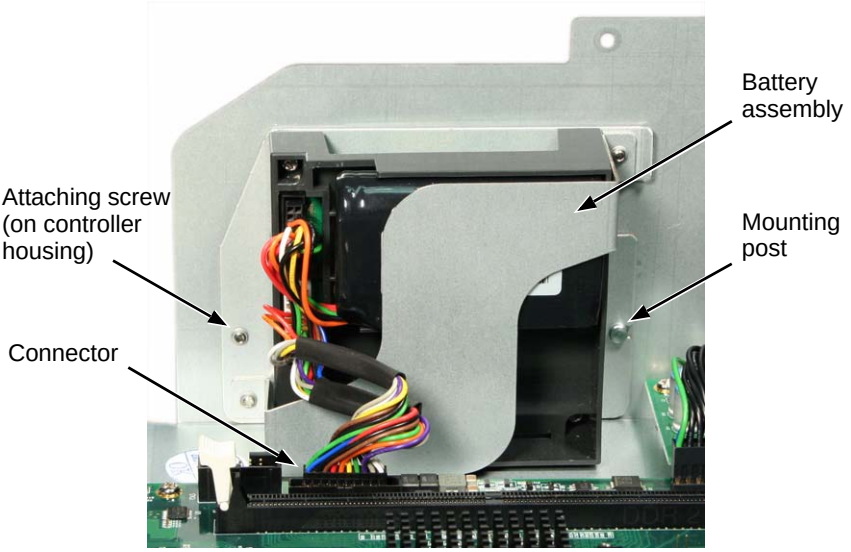
   See “Replacing a RAID Controller” on page 225.

4. Lay the RAID Controller on a non-static surface and remove the cover attaching screws, one on each side, then remove the cover.

   See page 227, Figure 3.

5. Remove the battery assembly attaching screw on the outside of the RAID controller housing.
6. Detach the battery connector and remove the battery assembly.

Figure 6. RAID Controller cache battery

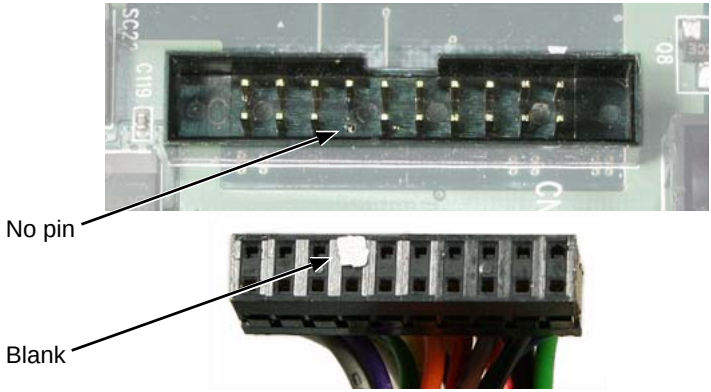


In the above photo, the memory module was removed so you can see the battery connector. You do not have to remove the memory module to replace the battery assembly.

7. Attach the connector of the new battery assembly.

   Be careful to line-up the connector pins correctly. See Figure 7.

Figure 7. Battery connector pins



8. Put the battery assembly into place and install the attaching screw.
9. Replace the RAID Controller cover and install the two attaching screws.
   See page 227, Figure 3.
10. Reinstall the RAID Controller.
    See “Replacing a RAID Controller” on page 225.

This completes the cache battery replacement procedure.

Replacing the Memory Module

The memory module is a single inline memory module (SIMM) installed on the main board of the RAID Controller. You might replace the memory module as a capacity upgrade as well as a repair.

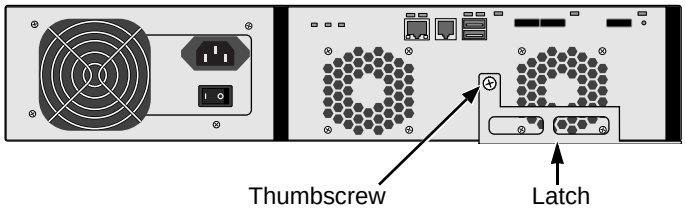
Cautions

- Only a qualified technician should perform this procedure.
- You must shut down the VessRAID subsystem before you can perform this procedure.
- Installing the wrong SIMM will cause boot failure.

To replace the memory module:

1. Shut down the VessRAID and remove the RAID Controller.
   See “Replacing a RAID Controller” on page 225.

Figure 8. Removing the RAID Controller

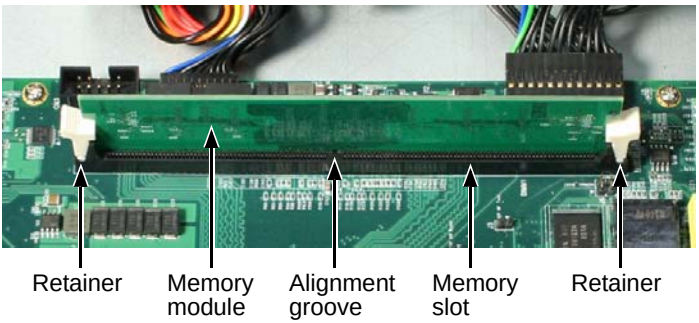


2. Lay the RAID Controller on a non-static surface and remove the cover attaching screws, one on each side, then remove the cover.

   See page 227, Figure 3.

3. Gently press the retainers outward until the memory module pops out of the memory slot.

Figure 9. RAID Controller memory module



4. Align the new memory module with the memory slot so the groove lines up.
5. Gently press the memory module into the slot until the retainers click into locked position.
6. Attach the RAID Controller cover and install the two attaching screws.

   See page 227, Figure 3.

7. Reinstall the RAID Controller.

   See “Replacing a RAID Controller” on page 225.

This completes the memory module replacement procedure.

Chapter 8: Technology Background

This chapter covers the following topics:

- Introduction to RAID (below)
- Choosing a RAID Level (page 244)
- Choosing Stripe Size (page 247)
- Choosing Sector Size (page 247)
- Cache Policy (page 248)
- Capacity Coercion (page 250)
- Initialization (page 251)
- Hot Spare Drive(s) (page 251)
- Partition and Format the Logical Drive (page 252)
- RAID Level Migration (page 252)
- Media Patrol (page 259)
- Predictive Data Migration (PDM) (page 260)
- Transition (page 261)

Introduction to RAID

RAID (Redundant Array of Independent Disks) allows multiple physical drives to be combined together in a disk array. Then all or a portion of the disk array is formed into a logical drive. The operating system sees the logical drive as a single storage device, and treats it as such.

The RAID software and controller manage all of the individual drives. The benefits of a RAID can include:

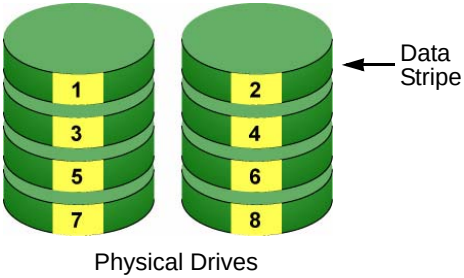
- Higher data transfer rates for increased server performance
- Increased overall storage capacity for a single drive designation (such as, C, D, E, etc.)
- Data redundancy/fault tolerance for ensuring continuous system operation in the event of a hard drive failure

Different types of logical drives use different organizational models and have varying benefits. Also see “Choosing a RAID Level” on page 244. The following outline breaks down the properties for each type of RAID logical drive:

RAID 0 – Stripe

When a logical drive is striped, the read and write blocks of data are interleaved between the sectors of multiple physical drives. Performance is increased, since the workload is balanced between drives or “members” that form the logical drive. Identical drives are recommended for performance as well as data storage efficiency.

Figure 1. RAID 0 Striping interleaves data across multiple drives



The disk array’s data capacity is equal to the number of disk drive members multiplied by the smallest drive's capacity. For example, one 100 GB and three 120 GB drives will form a 400 GB (4 x 100 GB) disk array instead of 460 GB.

If physical drives of different capacities are used, there will also be unused capacity on the larger drives.

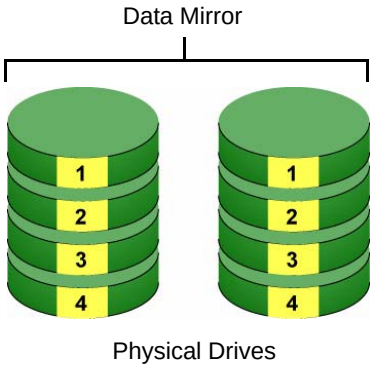
RAID 0 logical drives on VessRAID consist of one or more physical drives.

RAID 1 – Mirror

When a logical drive is mirrored, identical data is written to a pair of physical drives, while reads are performed in parallel. The reads are performed using elevator seek and load balancing techniques where the workload is distributed in the most efficient manner. Whichever drive is not busy and is positioned closer to the data will be accessed first.

With RAID 1, if one physical drive fails or has errors, the other mirrored physical drive continues to function. Moreover, if a spare physical drive is present, the spare drive will be used as the replacement drive and data will begin to be mirrored to it from the remaining good drive.

Figure 2. RAID 1 Mirrors identical data to two drives



The logical drive's data capacity equals the smaller physical drive. For example, a 100 GB physical drive and a 120 GB physical drive have a combined capacity of 100 GB in a mirrored logical drive.

If physical drives of different capacities are used, there will be unused capacity on the larger drive.

RAID 1 logical drives on VessRAID consist of two physical drives.

If you want a mirrored logical drive with more than two physical drives, see "RAID 1E – Enhanced Mirror" on page 236 and "RAID 10 – Mirror / Stripe" on page 239.

RAID 1E – Enhanced Mirror

RAID 1E offers the security of mirrored data provided by RAID 1 plus the added capacity of more than two physical drives. It also offers overall increased read/ write performance plus the flexibility of using an odd number of physical drives. With RAID 1E, each data stripe is mirrored onto two physical drives. If one drive fails or has errors, the other drives continue to function, providing fault tolerance.

Figure 3. RAID 1E can mirror data over an odd number of drives

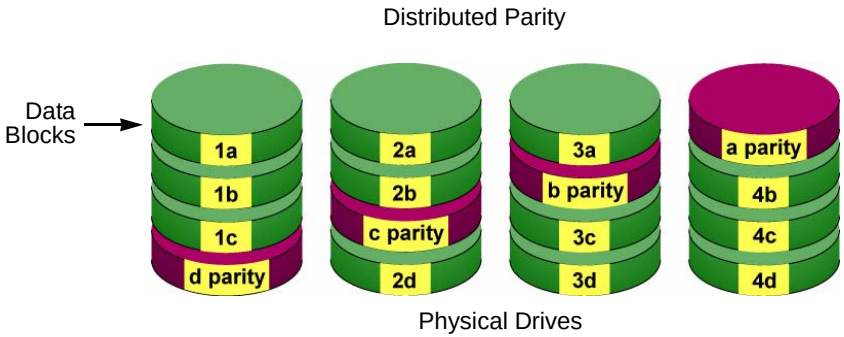
The advantage of RAID 1E is the ability to use an odd number of physical drives, unlike RAID 1 and RAID 10. You can also create a RAID 1E Logical Drive with an even number of physical drives. However, with an even number of drives, you will obtain somewhat greater security with comparable performance using RAID 10.

RAID 1E logical drives consist of three or more physical drives. You can create an array with just two physical drives and specify RAID 1E. But the resulting array will actually be a RAID 1.

RAID 5 – Block and Parity Stripe

RAID 5 organizes block data and parity data across the physical drives. Generally, RAID Level 5 tends to exhibit lower random write performance due to the heavy workload of parity recalculation for each I/O. RAID 5 is generally considered to be the most versatile RAID level. It works well for file, database, application and web servers.

Figure 4. RAID 5 stripes all drives with data and parity information



The capacity of a RAID 5 logical drive equals the smallest physical drive times the number of physical drives, minus one. Hence, a RAID 5 logical drive with four 100 GB physical drives will have a capacity of 300 GB. A RAID 5 logical drive with two 120 GB physical drives and one 100 GB physical drive will have a capacity of 200 GB.

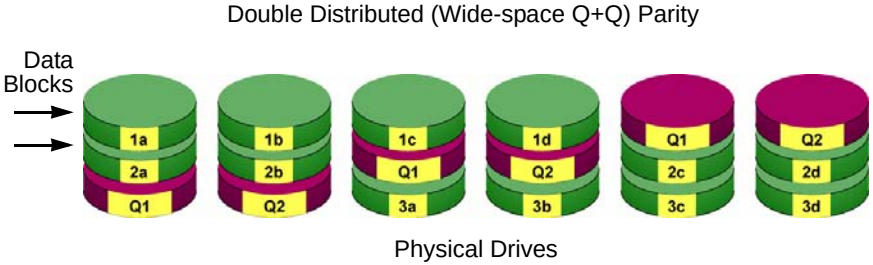
RAID 5 is generally considered to be the most versatile RAID level.

A RAID 5 on VessRAID consists of 3 to 32 physical drives.

RAID 6 – Block and Double Parity Stripe

RAID level 6 stores dual parity data is rotated across the physical drives along with the block data. A RAID 6 logical drive can continue to accept I/O requests when any *two* physical drives fail.

Figure 5. RAID 6 stripes all drives with data and dual parity



Hence, a RAID 6 logical drive with (7) 100 GB physical drives will have a capacity of 500 GB. A RAID 6 logical drive with (4) 100 GB physical drives will have a capacity of 200 GB.

RAID 6 becomes more capacity efficient in terms of physical drives as the number of physical drives increases.

RAID 6 provides double fault tolerance. Your logical drive remains available when up to *two* physical drives fail.

RAID 6 is generally considered to be the safest RAID level.

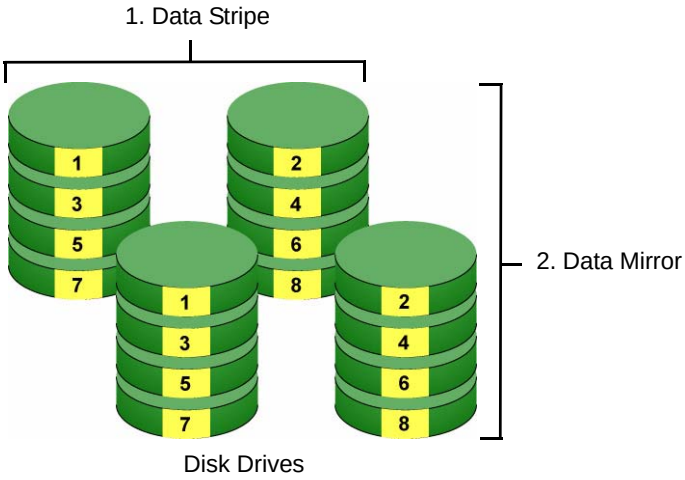
A RAID 6 on VessRAID consists of 4 to 32 physical drives.

RAID 10 – Mirror / Stripe

Mirror + Stripe combines both of the RAID 1 and RAID 0 logical drive types. RAID 10 can increase performance by reading and writing data in parallel—striping—while protecting data by duplicating it—mirroring.

Promise implements RAID 10 by creating a data stripe over one pair of disk drives, then mirroring the stripe over a second pair of disk drives. Some applications refer to this method as RAID 0+1.

Figure 6. Promise RAID 10 starts with a data stripe, then mirrors it



The data capacity RAID 10 logical drive equals the capacity of the smallest physical drive times the number of physical drives, divided by two.

In some cases, RAID 10 offers double fault tolerance, depending on which physical drives fail.

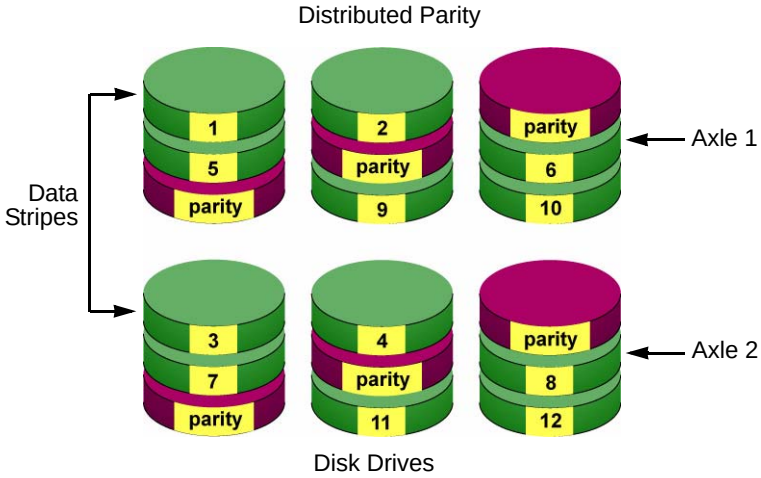
RAID 10 arrays require an even number of physical drives and a minimum of four.

For RAID 10 characteristics using an odd number of physical drives, choose RAID 1E.

RAID 50 – Striping of Distributed Parity

RAID 50 combines both RAID 5 and RAID 0 features. Data is striped across physical drives as in RAID 0, and it uses distributed parity as in RAID 5. RAID 50 provides data reliability, good overall performance, and supports larger volume sizes.

Figure 7. RAID 50 is a combination of RAID 5 and RAID 0



The data capacity RAID 50 logical drive equals the capacity of the smallest physical drive times the number of physical drives, minus two.

RAID 50 also provides very high reliability because data is still available even if multiple physical drives fail (one in each axle). The greater the number of axles, the greater the number of physical drives that can fail without the RAID 50 logical drive going offline.

Component	Minimum	Maximum
Number of Axles	2	16
Physical Drives per Axle	3	32
Physical Drives per Logical Drive	6	256

RAID 50 Axles

When you create a RAID 50, you must specify the number of axles. An axle refers to a single RAID 5 logical drive that is striped with other RAID 5 logical drives to make RAID 50. An axle can have from 3 to 16 physical drives, depending on the number of physical drives in the logical drive.

The chart below shows RAID 50 logical drives with 6 to 16 physical drives, the available number of axles, and the resulting distribution of physical drives on each axle.

RAID 50 Logical Drive						
No. of Drives	**No. of Axles**	**Drives per Axle**		**No. of Drives**	**No. of Axles**	**Drives per Axle**
6	2	3,3		14	2	7,7
7	2	3,4			3	4,5,5
8	2	4,4			4	3,3,4,4
9	2	4,5		15	2	7,8
	3	3,3,3			3	5,5,5
10	2	5,5			4	3,4,4,4
	3	3,3,4			5	3,3,3,3,3
11	2	5,6		16	2	8,8
	3	3,4,4			3	5,5,6
12	2	6,6			4	4,4,4,4
	3	4,4,4			5	3,3,3,3,4
	4	3,3,3,3				
13	2	6,7				
	3	4,4,5				
	4	3,3,3,4				

RAID 60 – Striping of Double Parity

RAID 60 combines both RAID 6 and RAID 0 features. Data is striped across disks as in RAID 0, and it uses double distributed parity as in RAID 6. RAID 60 provides data reliability, good overall performance and supports larger volume sizes.

Figure 8. RAID 60 is a combination of RAID 6 and RAID 0

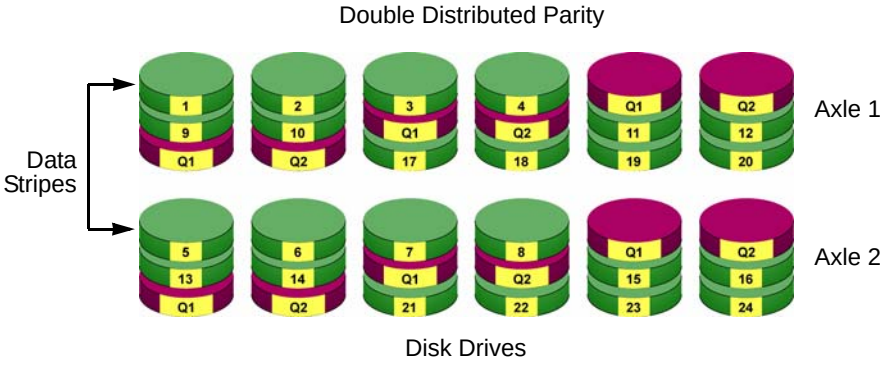


Figure 9. RAID 60 Striping of Double Distributed Parity disk arrays

The total capacity of a RAID 60 logical drive is the smallest physical drive times the number of physical drives, minus four.

RAID 60 also provides very high reliability because data is still available even if multiple physical drives fail (two in each axle). The greater the number of axles, the greater the number of physical drives that can fail without the RAID 60 logical drive going offline.

Component	Minimum	Maximum
Number of Axles	2	16
Physical Drives per Axle	4	32
Physical Drives per Logical Drive	8	256

RAID 60 Axles

When you create a RAID 60, you must specify the number of axles. An axle refers to a single RAID 6 logical drive that is striped with other RAID 6 logical drives to make RAID 60. An axle can have from 4 to 16 physical drives, depending on the number of physical drives in the logical drive.

The chart below shows RAID 60 logical drives with 8 to 20 physical drives, the available number of axles, and the resulting distribution of physical drives on each axle.

RAID 60 Logical Drive						
No. of Drives	**No. of Axles**	**Drives per Axle**		**No. of Drives**	**No. of Axles**	**Drives per Axle**
8	2	4,4		17	2	8,9
9	2	4,5			3	5,6,6
10	2	5,5			4	4,4,4,5
11	2	5,6		18	2	9,9
12	2	6,6			3	6,6,6
	3	4,4,4			4	4,4,5,5
13	2	6,7		19	2	9,10
	3	4,4,5			3	6,6,7
14	2	7,7			4	4,5,5,5
	3	4,5,5		20	2	10,10
15	2	7,8			3	6,7,7
	3	5,5,5			4	5,5,5,5
16	2	8,8			5	4,4,4,4,4
	3	5,5,6				
	4	4,4,4,4				

Choosing a RAID Level

There are several issues to consider when choosing the RAID Level for your VessRAID disk array. The following discussion summarizes some advantages, disadvantages, and applications for each choice.

RAID 0

Advantages	Disadvantages
Implements a striped disk array, the data is broken down into blocks and each block is written to a separate disk drive I/O performance is greatly improved by spreading the I/O load across many channels and drives No parity calculation overhead is involved	Not a true RAID because it is not fault-tolerant The failure of just one drive will result in all data in an disk array being lost Should not be used in mission critical environments

Recommended Applications for RAID 0

- Image Editing
- Pre-Press Applications
- Any application requiring high bandwidth

RAID 1

Advantages	Disadvantages
Simplest RAID storage subsystem design Can increase read performance by processing data requests in parallel since the same data resides on two different drives	Very high disk overhead - uses only 50% of total capacity

Recommended Applications for RAID 1

- Accounting
- Payroll
- Financial
- Any application requiring very high availability

RAID 1E

Advantages	Disadvantages
Implemented as a mirrored disk array whose segments are RAID 0 disk arrays High I/O rates are achieved thanks to multiple stripe segments Can use an odd number of disks	Very high disk overhead - uses only 50% of total capacity

Recommended Applications for RAID 1E

- Imaging applications
- Database servers
- General file server

RAID 5

Advantages	Disadvantages
High Read data transaction rate Medium Write data transaction rate Good aggregate transfer rate	Disk failure has a medium impact on throughput

Recommended Applications for RAID 5

- File and Application servers
- WWW, E-mail, and News servers
- Intranet servers
- Most versatile RAID level

RAID 6

Advantages	Disadvantages
High Read data transaction rate Medium Write data transaction rate Good aggregate transfer rate Safest RAID level, except for RAID 60	High disk overhead – equivalent of two drives used for parity Slightly lower performance than RAID 5

Recommended Applications for RAID 6

- Accounting and Financial
- Database servers
- Any application requiring very high availability

RAID 10

Advantages	Disadvantages
Implemented as a mirrored disk array whose segments are RAID 0 disk arrays High I/O rates are achieved thanks to multiple stripe segments	Very high disk overhead - uses only 50% of total capacity

Recommended Applications for RAID 10

- Imaging applications
- Database servers
- General file server

RAID 50

Advantages	Disadvantages
High Read data transaction rate Medium Write data transaction rate Good aggregate transfer rate High reliability Supports large volume sizes	Higher disk overhead than RAID 5

Recommended Applications for RAID 50

- File and Application servers
- Transaction processing
- Office application with many users accessing small files

RAID 60

Advantages	Disadvantages
High Read data transaction rate Medium Write data transaction rate Good aggregate transfer rate Safest RAID level	High disk overhead – equivalent of two drives used for parity Slightly lower performance than RAID 50

Recommended Applications for RAID 60:

- Accounting and Financial
- Database servers
- Any application requiring very high availability

Choosing Stripe Size

Stripe Size, also called “Stripe Block Size”, refers to the size of the data blocks written to, and read from, the physical drives. Stripe Size is specified when you create a disk array. In order to change the Stripe Size of an existing disk array, you must delete the disk array and create a new one. You can choose Stripe Size directly when you use the Advanced function to create a disk array. If you use the Express function to create a disk array, WebPAM PRO selects the Stripe Size when you choose an Application Type.

The available Stripe Sizes are 64, 128, 256 KB, 512 KB, and 1 MB. 64 KB is the default. There are two issues to consider when selecting the Stripe Size.

First, you should choose a Stripe Size equal to, or smaller than, the smallest cache buffer found on any physical drive in the disk array. Selecting a larger value slows read/write performance because physical drives with smaller cache buffers need more time for multiple accesses to fill their buffers.

Second, if your data retrieval consists of fixed data blocks, such as with some database or video applications, then you should choose that size as your Stripe Size.

If you do not know the cache buffer or fixed data block sizes, Promise suggests you choose 64 KB as your Stripe Size. Generally speaking, email, POS, and Web Servers prefer smaller stripe sizes. Video and database applications prefer larger stripe sizes.

Choosing Sector Size

A sector is the smallest addressable area on a physical disk drive. Sector Size refers to the size of sector measured by the number of bytes of data it can hold. The most common sector size is 512 bytes (512 B). A smaller sector size results in a more efficient use of a disk drive’s capacity. 512 B is the default sector size for logical drives on VessRAID.

The number of usable sectors is limited by the addressing method of the computer's operating system:

- Windows 2000 and Windows XP (32-bit) support 10-bit logical bit addressing (LBA), so with 512 B sectors, they can only support up to 2 terabytes (TB) of data storage capacity. To increase the capacity, you must use larger sectors. See “2 TB Limitation” on page 248.
- Windows XP (64-bit), Windows 2003 Server, Windows 2008 Server, and Windows Vista support 64-bit LBA, so they are not affected by this limitation. For these OSes, always choose the default 512 B sector size.
- Linux operating systems with the 2.4 kernel do not support variable sector sizes. For these OSes, always choose the default 512 B sector size.

- Linux operating systems with the 2.6 kernel support 64-bit LBA. For these OSes, always choose the default 512 B sector size.

2 TB Limitation

If your Host PC runs Windows 2000 or Windows XP (32-bit), and you want to create logical drives larger than 2TB, you must choose a sector size larger than 512 B when you create the logical drive. The table below correlates sector size with logical drive capacity.

Logical Drive Size	Sector Size
8 to 16 TB	4096 bytes (4 KB)
4 to 8 TB	2048 bytes (2 KB)
2 to 4 TB	1024 bytes (1 KB)
0 to 2 TB	512 bytes (512 B)

Because logical drives can be expanded, you may encounter a situation where the usable capacity of your expanded logical drive is reduced by the addressing issue described above. There are two alternatives:

- Limit your logical drive expansion to within the limits described in the chart.
- Back up your data, then delete your existing logical drive and create a new one with a larger sector size.

Cache Policy

As it is used with VessRAID, the term cache refers to any of several kinds of high-speed, volatile memory that hold data moving from your computer to the physical drives or vice-versa. Cache is important because it can read and write data much faster than a physical drive. There are read caches, which hold data as it is read from a physical drive; and write caches, which hold data as it is written to a physical drive.

In order to tune the cache for best performance in different applications, user-adjustable settings are provided. Cache settings are made in conjunction with logical drives:

- When you create a logical drive. See “Creating a Logical Drive” on page 112 (WebPAM PROe) or page 157 (CLU)
- On an existing logical drive. See “Making Logical Drive Settings” on page 120 (WebPAM PROe) or “Setting Write Cache Policy” on page 162 (CLU)

Read Cache Policy

- **Read Cache** – The read cache is enabled.
- **Read Ahead** – The read cache and the read-ahead feature are enabled. Read-ahead anticipates the next read and performs it before the request is made. Can increase read performance.
- **No Cache** – The read cache is disabled.

Write Cache Policy

- **Write Back** – Data is written first to the cache, then to the logical drive. Better performance. VessRAID has a cache backup battery to protect data in the cache from a sudden power failure.
- **Write Thru** – Also “Write Through”. Data is written to the cache and the logical drive at the same time. Safer.

If your write cache policy is set to *Write Back*, the write policy automatically changes to *Write Thru* when all of the following conditions occur:

- The logical drive write policy is set to Write Back
- The Adaptive Writeback Cache feature is enabled
- The cache backup battery goes offline

When the battery comes back online, the write policy automatically changes back to Write Back.

Adaptive Writeback Cache

On the VessRAID subsystem, you can set the logical drive write cache policy to *Write Thru* or *Write Back*.

If you set the write cache policy to *Write Back*, your data is first written to the controller cache, and later to the logical drive. This action improves performance. To preserve the data in the cache in the event of a power failure, the subsystem has a backup battery that powers the cache. To see an estimate of how long the battery will power the cache, see “Checking the Battery” on page 93 or page 142.

The Adaptive Writeback Cache feature protects your data by changing the write cache settings while the cache backup battery is offline. When all of the following conditions occur:

- The logical drive write policy is set to Write Back
- The Adaptive Writeback Cache feature is enabled
- The cache backup battery goes offline

The write policy automatically changes to *Write Thru*. When the battery comes back online, the write policy automatically changes back to *Write Back*.

To enable the Adaptive Writeback Cache option, see “Making Controller Settings” on page 87 (WebPAM PROe) or page 137 (CLU).

Also see “Replacing the Cache Battery” on page 228.

Capacity Coercion

This feature is designed for fault-tolerant logical drives (RAID 1, 1E, 5, 10, 50, and 60). It is generally recommended to use physical drives of the same size in your disk arrays. When this is not possible, physical drives of different sizes will work but the system must adjust for the size differences by reducing or coercing the capacity of the larger drives to match the smaller ones. With VessRAID, you can choose to enable Capacity Coercion and any one of four methods.

Enable Capacity Coercion and choose the Method in the Controller Settings menu. See page 87 (WebPAM PROe) or page 137 (CLU). The choices are:

- GB Truncate – (Default) Reduces the useful capacity to the nearest 1,000,000,000 byte boundary.
- 10GB Truncate – Reduces the useful capacity to the nearest 10,000,000,000 byte boundary.
- Group Rounding – Uses an algorithm to determine how much to truncate. Results in the maximum amount of usable drive capacity.
- Table Rounding – Applies a predefined table to determine how much to truncate.

Capacity Coercion also affects a replacement drive used in a disk array. Normally, when an physical drive fails, the replacement drive must be the same capacity or larger. However, the Capacity Coercion feature permits the installation of a replacement drive that is slightly smaller (within 1 gigabyte) than the remaining working drive. For example, the remaining working drives can be 80.5 GB and the replacement drive can be 80.3, since all are rounded down to 80 GB. This permits the smaller drive to be used.

Without Capacity Coercion, the controller will not permit the use of a replacement physical drive that is slightly smaller than the remaining working drive(s).

Initialization

Initialization is done to logical drives after they are created from a disk array. Initialization sets all data bits in the logical drive to zero. The action is useful because there may be residual data on the logical drives left behind from earlier configurations. For this reason, Initialization is recommended for all new logical drives. See “Initializing a Logical Drive” on page 120 (WebPAM PROe) or page 163 (CLU).

Caution

When you initialize a logical drive, all the data on the logical drive will be lost. Backup any important data before you initialize a logical drive.

Hot Spare Drive(s)

A hot spare is a disk drive that is connected to the disk array system but is not assigned as a member of the disk array. In the event of the failure of a drive within a functioning fault tolerant disk array, the hot spare is activated as a member of the disk array to replace a drive that has failed.

VessRAID will replace a failing disk drive in a disk array with an unassigned drive, if one is available. The unassigned drive is not part of any disk array. Such a drive is called a *hot spare* drive. There are two types:

- **Global** – An unassigned disk drive available to any disk array on the VessRAID.
- **Dedicated** – An unassigned disk drive that can only be used by a specified disk array.

The hot spare policy function lets you choose whether a disk array will access any unassigned disk drive or a designated drive in the event of disk drive failure. See “Managing Spare Drives” on page 124 (WebPAM PROe) or page 159 (CLU) for information on how to make this setting.

The spare drive effectively takes the place of the failed drive and the RAID system immediately begins to rebuild data onto the drive. When the rebuild is complete, the disk array is returned to fault tolerant status.

VessRAID includes a function that enables you to return a hot spare drive from a disk array back to spare status. When you create the hot spare drive, check the Revertible box to enable this feature. See “Transition” on page 261.

See also “Critical & Offline Disk Arrays” on page 290.

Partition and Format the Logical Drive

Like any other type of fixed disk media in your system, a RAID logical drive must also be partitioned and formatted before use. Use the same method of partitioning and formatting on an logical drive as you would any other fixed disk.

Depending on the operating system you use, there may or may not be various capacity limitations applicable for the different types of partitions.

RAID Level Migration

To *migrate* a disk array is to do one or both:

- Change its RAID level
- Increase the number of disk drives (sometimes called Expansion)

On VessRAID, RAID level migration is performed on the disk array but it applies to the logical drives. Migration takes place on an existing Functional disk array without disturbing the existing data. While the disk array is migrating, you can access the data as before. When migration is complete, your disk array will have a different RAID level and/or a larger capacity.

In most cases, you must add one or more physical drives during the migration process. You can never reduce the number of physical drives.

The tables below show the migration options for a source logical drive according to its RAID level. The available target RAID levels are shown with their requirements.

See “Migrating a Disk Array” on page 113 or page 155.

RAID 0

A RAID 0 source logical drive can migrate to the following target logical drives:

Target	Requirements
RAID 0	Add physical drives.
RAID 1	2 physical drives only. Only a single-drive RAID 0 can migrate to RAID 1 by adding 1 physical drive.
RAID 1E	3 or more physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 5	3 physical drives minimum, 32 maximum. RAID 0 must have less than 16 physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 6	4 physical drives minimum, 32 maximum. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 10	4 physical drives minimum. Even number of physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 50	6 physical drives minimum, 32 per axle maximum. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 60	8 physical drives minimum, 32 per axle maximum. If existing physical drives have no unused space, add 1 or more physical drives.

RAID 1

A RAID 1 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 0	None.
RAID 1E	3 or more physical drives. Add 1 or more physical drives.
RAID 5	3 physical drives minimum, 32 maximum. Add 1 or more physical drives.
RAID 10	4 physical drives minimum. Even number of physical drives. Add 2 or more physical drives.
RAID 50	6 physical drives minimum, 32 per axle maximum. Add 4 or more physical drives.

RAID 1E

A RAID 1E Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 0	None.
RAID 1E	Add physical drives.
RAID 5	3 physical drives minimum, 32 maximum. RAID 1E must have less than 32 physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 10	4 physical drives minimum. Even number of physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 50	6 physical drives minimum, 32 per axle maximum.

RAID 5

A RAID 5 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 0	None.
RAID 1E	None.
RAID 5	Add physical drives. 32 maximum.
RAID 6	4 physical drives minimum, 32 maximum. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 10	4 physical drives minimum. Even number of physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 50	6 physical drives minimum, 32 per axle maximum. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 60	8 physical drives minimum, 32 per axle maximum. If existing physical drives have no unused space, add 1 or more physical drives.

RAID 6

A RAID 6 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 6	Add physical drives. 32 maximum.
RAID 60	8 physical drives minimum, 32 per axle maximum. If existing physical drives have no unused space, add 1 or more physical drives.

RAID 10

A RAID 10 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 0	None.
RAID 1E	None.
RAID 5	3 physical drives minimum, 32 maximum. RAID 10 must have less than 16 physical drives.
RAID 6	4 physical drives minimum, 32maximum. RAID 10 must have less than 32 physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 10	Add physical drives. Even number of physical drives.
RAID 50	6 physical drives minimum, 32 per axle maximum.
RAID 60	8 physical drives minimum, 32 per axle maximum. If existing physical drives have no unused space, add 1 or more physical drives.

RAID 50

A RAID 50 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 0	None.
RAID 1E	None.
RAID 5	32 physical drives maximum. RAID 50 must have less than 32 physical drives.
RAID 6	32 physical drives maximum. RAID 50 must have less than 16 physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 10	Even number of physical drives.
RAID 50	Add physical drives. 32 per axle maximum.
RAID 60	8 physical drives minimum, 32 per axle maximum. If existing physical drives have no unused space, add 1 or more physical drives.

RAID 60

A RAID 60 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 6	32 physical drives maximum. RAID 60 must have less than 32 physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 60	Add physical drives. 32 per axle maximum.

Important

- The Target disk array may require more physical drives than the Source disk array
- If the Target disk array requires an EVEN number of physical drives but the Source disk array has an ODD number, ADD a physical drive as part of the migration process
- You cannot reduce the number of physical drives in your disk array, even if the Target disk array requires fewer physical drives than the Source disk array
- RAID 1 (mirroring) works with two drives only. Only a single-drive RAID 0 disk array can migrate to RAID 1. Other RAID Levels use too many drives to migrate
- You cannot migrate a disk array when it is Critical or performing activities such as Synchronizing, Rebuilding, and PDM
- For RAID 6 or RAID 60, you can only migrate between these two RAID levels. Destination RAID 60 axles can have up to 32 physical drives. Other limitations might apply

Ranges of Disk Array Expansion

The Windows 2000 and Windows XP (32-bit) operating systems support a 10-byte LBA format. As a result, these OSes can only recognize 4 billion addresses. If you create a logical drive using the default 512 B sector size, the logical drive will be limited to 2 TB of data, even if there is more space available on your disk drives.

This limitation does not apply to Windows XP (64-bit), 2003 Server, Vista, and Linux OSes with the 2.6 kernel. Linux OSes with the 2.4 kernel do not support variable sector sizes, therefore you cannot apply the solution described here to those OSes.

Note that once you create your logical drive, you cannot change the size of the sectors. Nor can you increase the number of address blocks that the OS recognizes.

You can direct WebPAM PROe to expand a logical drive beyond the maximum expansion size. When the expansion is finished:

- WebPAM PROe will show the logical drive in the desired size.
- Your operating system might show the logical drive at the maximum size listed in the table below.
- Additional capacity might appear as unpartitioned and unformatted.

Current LD Size	Maximum LD Expansion Size	Sector Size
8 to 16 TB	16 TB	4096 bytes
4 to 8 TB	8 TB	2048 bytes
2 to 4 TB	4 TB	1024 bytes
up to 2 TB	2 TB	512 bytes

At this point, you have the choice of:

- Format the unpartitioned/unformatted capacity as a *second* logical drive
- Delete the existing disk array and create a new one in the desired size

Delete and Recreate

If you require a logical drive larger than the maximum expansion size:

1. Backup the data from the current logical drive.
2. Delete the current logical drive.
   See page 113 (WebPAM PROe) or page 158 (CLU).
3. Create a new logical drive with the desired capacity.
   See page 112 (WebPAM PROe) or page 157 (CLU).
4. Restore the data to the new logical drive.

Media Patrol

Media Patrol is a routine maintenance procedure that checks the magnetic media on each disk drive. Media Patrol checks all physical drives assigned to disk arrays. Media Patrol does not check unconfigured drives.

Media Patrol will also check spare drives, if those drives have Media Patrol enabled. Media Patrol for spare drives is enabled by default. You can disable it in VessRAID's Command Line Interface (CLI).

Unlike Synchronization and Redundancy Check, Media Patrol is concerned with the condition of the media itself, not the data recorded on the media. If Media Patrol encounters a critical error, it triggers PDM if PDM is enabled.

You can run Media Patrol from the subsystem. See "Running Media Patrol" on page 55 (WebPAM PROe) or page 135 (CLU).

You can also run Media Patrol on a disk array. See "Running Media Patrol on a Disk Array" on page 115 (WebPAM PROe only).

Predictive Data Migration (PDM)

Predictive Data Migration (PDM) is the migration of data from the suspect disk drive to a spare disk drive, similar to Rebuilding a Logical Drive. But unlike Rebuilding, PDM constantly monitors your disk drives and automatically copies your data to a spare disk drive *before* the disk drive fails and your Logical Drive goes Critical. See “Running PDM” on page 56 (WebPAM PROe) or page 156 (CLU).

After the data is copied from the suspect disk drive, the controller marks the suspect disk drive with a *Stale* configuration and a *PFA* error.

You can clear the Stale configuration and PFA error and put the disk drive back into service. See “Clearing Stale and PFA Conditions” on page 99 (WebPAM PROe) or page 146 (CLU). In some cases, however, you might remove the disk drive for repair or replacement.

PDM Triggers

The following actions trigger PDM:

- A disk drive with unhealthy status (see below)
- Media Patrol finds a disk critical error*
- You initiate PDM manually

*PDM also counts the number of media errors reported by Media Patrol.

A disk drive becomes unhealthy when:

- A SMART error is reported
- The bad sector remapping table fills to the specified level

Because data would be lost if written to a bad sector, when a bad sector is detected, the disk drive creates a map around it. These maps are saved in the bad sector remapping table, which has a capacity of 512 reassigned blocks and 1024 error blocks.

When the table fills to a specified percentage of its capacity, PDM triggers a migration of data from the suspect drive (the disk drive with the bad sectors) to a spare disk drive.

During data migration, you will have access to the Logical Drive but it will respond more slowly to read/write tasks because of the additional operation. The time required for data migration depends on the size of the disk drive.

See “Making Background Activity Settings” on page 54 (WebPAM PROe) or page 168 (CLU).

Transition

The Transition feature enables you to specify “permanent” spare drives for your VessRAID subsystem. Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare. The revertible spare drive returns to its original status.

Transition happens *automatically* when the following sequence of events takes place:

- You create a revertible spare drive.

  See page 125 (WebPAM PROe) or page 159 (CLU).
- A physical drive assigned to your disk array fails and the array goes critical or degraded.
- VessRAID automatically rebuilds your array to the revertible spare drive and the array becomes functional again.
- You replace the failed physical drive with a new physical drive of equal or greater capacity.
- VessRAID automatically transitions (moves) the data from the revertible spare to the new physical drive.
- The new physical drive becomes part of the array and the revertible spare drive returns to its original spare status.

Transition happens *manually* when you specify a different unconfigured physical drive to transition (move) the data from the revertible spare drive.

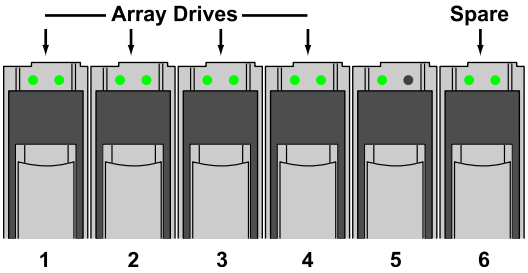
Caution

VessRAID supports disk drive hot-swapping. To avoid hand contact with an electrical hazard, do not remove more than one drive carrier a time.

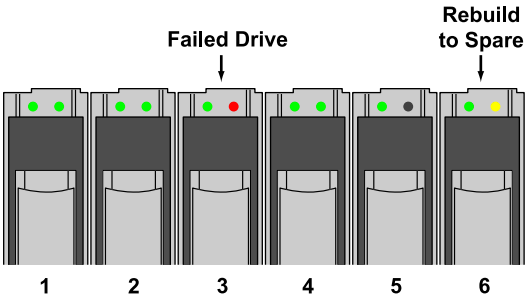
See the example below.

Example

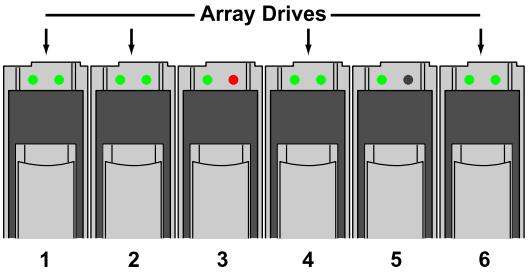
Following is an example to explain the Transition function.



In the example above, there is a four-drive RAID 5 disk array and a global spare drive. Physical drives 1, 2, 3, and 4 belong to the disk array. Physical drive 5 remains unconfigured. Physical drive 6 is a revertible spare drive.



If a physical drive fails in a disk array and there is a spare drive of adequate capacity available, the controller automatically rebuilds the array using the spare drive. In this example, physical drive 3 failed and the array is rebuilt using physical drive 6, the revertible spare drive.

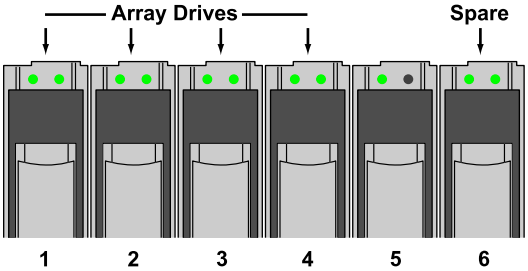


When the rebuild is complete, the spare drive has replaced the failed drive. In this example, failed drive 3 was replaced by spare drive 6. The disk array now consists of physical drives 1, 2, 4, and 6.

There is no spare drive at this moment. Even if physical drive 5 is of adequate capacity, it has not been designated as a spare, therefore the controller cannot use it as a spare.

Automatic Transition

At this juncture, you would replace the failed drive in slot 3 with a new one of the same or greater capacity.



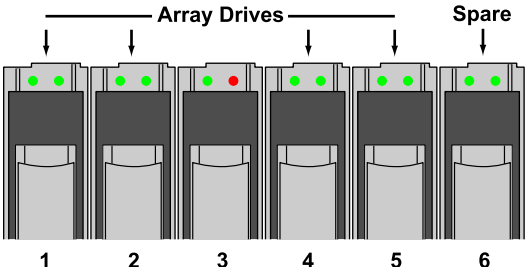
When the VessRAID controller detects the new drive in slot 3, it will:

- Automatically transition the data on drive 6 to drive 3
- Return drive 6 to spare status

When the Automatic Transition is finished, physical drives 1, 2, 3, and 4 belong to the disk array and physical drive 6 is a revertible spare drive. The original configuration is restored.

Manual Transition

If you wanted to use the drive in slot 5 as a member of the disk array, rather than the drive in slot 3, you would run the Transition function manually. See page 116 (WebPAM PROe) or page 156 (CLU).



When the Manual Transition is finished, physical drives 1, 2, 4, and 5 belong to the disk array and physical drive 6 is a revertible spare drive.

At this point, you would replace the drive in slot 3. The new drive in slot 3 will be unconfigured until you assign it to a disk array or as a spare.

Chapter 9: Troubleshooting

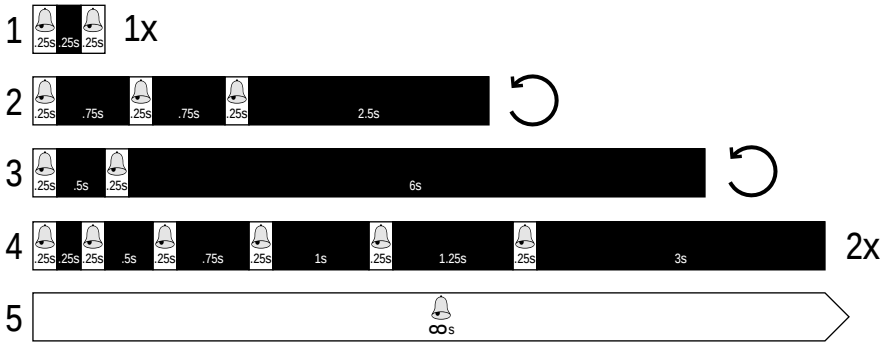
This chapter covers the following topics:

- VessRAID is Beeping (below)
- LEDs Display Amber or Red (page 266)
- CLU Reports a Problem (page 270)
- WebPAM PROe Reports a Problem (page 272)
- LCD Panel Reports a Problem (page 275)
- Viewing a Report from OPAS (page 275)
- Event Notification Response (page 277)
- Critical & Offline Disk Arrays (page 290)
- Incomplete Array (page 293)
- Physical Drive Problems (page 294)
- Enclosure Problems (page 296)
- Connection Problems (page 299)
- Browser Does Not Connect to WebPAM PROe (page 301)
- Unsaved Data in the Controller Cache (page 302)

VessRAID is Beeping

VessRAID's alarm has five different patterns, as shown below.

Figure 1. Audible alarm sound patterns



When you first power-up the VessRAID, it beeps twice to show normal operation.

The audible alarm sounds at other times to inform you that the VessRAID needs attention. But the alarm does not specify the condition. When the alarm sounds:

- Check the front and back of VessRAID for red or amber LEDs, as described above.

- If email notification is enabled, check for new messages.
- Check for yellow !s red Xs in Tree View, see page 272.
- Check the event log. See page 47 or page 170.

When a continuous tone sounds, there are multiple alarm patterns sounding at the same time.

To make alarm settings or cancel an alarm, see “Making Buzzer Settings” on page 94 or page 193.

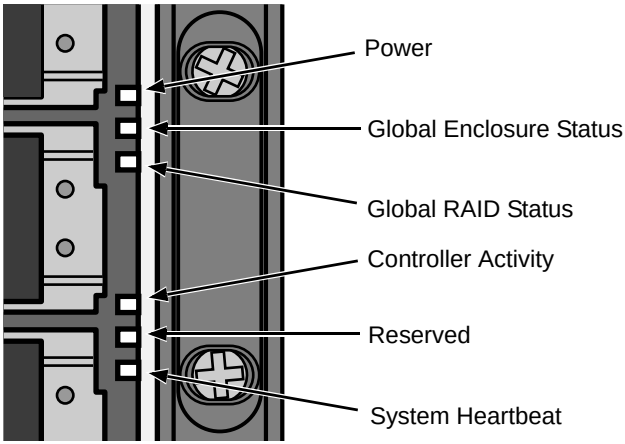
LEDs Display Amber or Red

Front Panel LEDs

When boot-up is finished and the VessRAID subsystem is functioning normally:

- Power, Global Enclosure Status, and Global RAID Status LEDs display green continuously.
- Controller Activity LED flashes green when there is controller activity.
- System Heartbeat LED blinks green seven times in three seconds, goes dark for six seconds, then repeats the pattern.

Figure 2. VessRAID front panel LEDs



See the table below.

LEDs	State				
	Dark	**Steady Green**	**Flashing Green**	**Amber**	**Red**
Power	System Off	Normal	—	—	—
Global RAID Status	System Off	Normal	—	Logical Drive Critical	Logical Drive Offline
Global Enclosure Status	System Off	Normal	Locating the Enclosure	Fan, battery, power supply, temperature, or voltage problem*	
Controller Activity	System Off or no SAS ports connected	One or more SAS ports connected	Activity	—	—
Controller Heartbeat	System Off	—	Normal*	—	—

* Check the LEDs on the back of the enclosure for more information.

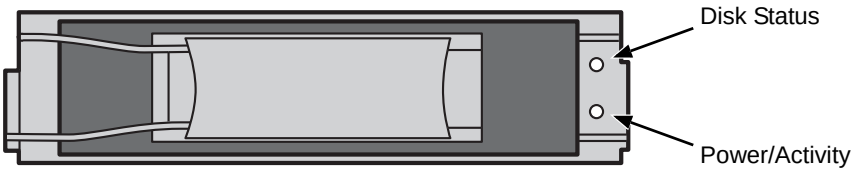
** Blinks blinks green seven times in three seconds, goes dark for six seconds, then repeats the pattern.

When the Global Enclosure LED on VessRAID's front panel shows Amber or Red, check the LEDs on the back of VessRAID. These LEDs give the status of individual components. See page 269, Figure 5.

Disk Drive LEDs

There are two LEDs on each Drive Carrier. They report the presence of a disk drive, activity of the drive, and the drive's current condition.

Figure 3. VessRAID disk drive carrier LEDs



If there is a disk drive in the carrier, the Power/Activity LED displays Green. If not, the Power/Activity LED remains dark.

The Power/Activity LED flashes during drive activity.

The Disk Status LED displays Green when a drive is present and configured.

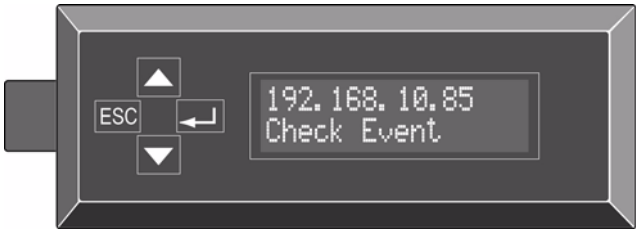
LEDs	State				
	Dark	**Steady Green**	**Flashing Green**	**Amber**	**Red**
Power/ Activity	No Drive	Drive Present	Activity	—	—
Status	No Drive or Unconfigured	Drive OK	Locating the Drive	Drive Rebuilding	Array Drive Offline

See “Critical & Offline Disk Arrays” on page 290 for a discussion of rebuilding and failed disk drives.

LCD Panel

When the VessRAID is fully booted and running under normal conditions, the LCD screen shows the VessRAID model number and IP address. If a problem is detected in the subsystem, the LCD screen displays a *Check Event* message, as shown in Figure 4.

Figure 4. VessRAID optional LCD display

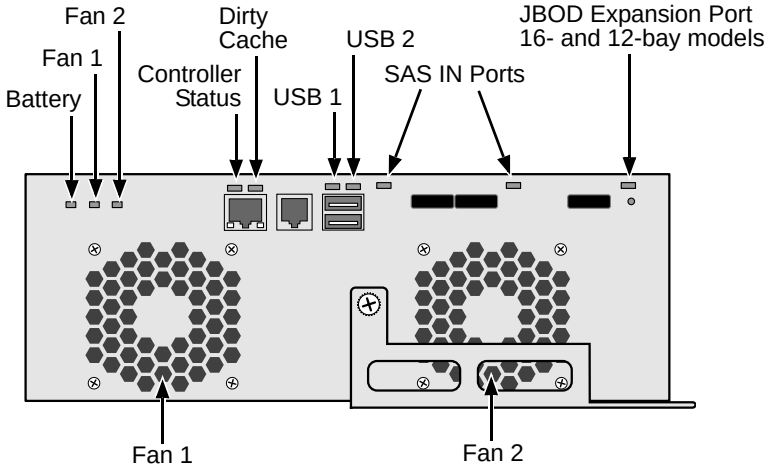


Press the ▲ or ▼ button to see the *View Events* menu. Then press the ↵ button to read the Events.

Controller LEDs

Under normal conditions, the Controller Status LED is green and the Dirty Cache LED icon is dark. The battery and fan LEDs should display green. See the figure and table below.

Figure 5. VessRAID Controller LEDs



LEDs	State				
	Dark	**Green**	**Amber**	**Red**	**Blinking**
Controller Status	no power	OK	Error	Malfunction at start-up	Green: Activity
Dirty Cache	No data in cache	—	Unsaved data in cache	—	Amber: Unsaved data in cache
Battery	Not detected or Not installed	OK	Backup capacity below 72 hours	No power to controller cache	—
Fan	Not detected	OK	One fan turning too slowly	Multiple fans turning too slowly	—
USB Ports	No device detected	Device detected	—	Failed data transfer	Amber: Activity
SAS OUT Port	No connection	Port connected	—	—	Green: Activity

If the Controller Status LED is amber, restart the VessRAID. See “Restarting the Subsystem” on page 85 (WebPAM PROe) or page 191 (CLU).

If the Controller Status LED continues to display amber after startup, contact Promise Technical Support. See page 305.

The Dirty Cache LED flashes during input/output operation. If the LED shines amber and the power is off, there is unsaved data in the cache. Do NOT power down the VessRAID while this LED is on. See “Browser Does Not Connect to WebPAM PROe” on page 301 for more information.

If the battery LED is amber or red, try reconditioning the battery. See “Reconditioning a Battery” on page 94 or page 143. If the condition returns, replace the battery.

If the fan LED is amber or red:

1. Identify the malfunctioning fan. See “Viewing Enclosure Information” on page 91 or page 140.
2. Replace the fan. See “Replacing a Cooling Fan” on page 226.

Also see “Enclosure Problems” on page 296.

CLU Reports a Problem

The CLU reports information passively—you must determine which functions to check based on the sound of the VessRAID’s buzzer and any amber or red LEDs. See page 265 through 269.

Check the event logs first. Then check the reported component.

Viewing Runtime Events

To display Runtime Events:

1. From the Main Menu, highlight *Event Viewer* and press Enter.

   The log of Runtime Events appears. Events are added to the top of the list. Each item includes:

   - Sequence number – Begins with 0 at system startup.
   - Device – Disk Array, Logical Drive, Physical Drive by its ID number.
   - Severity – (lowest to highest) Information, Warning, Minor, Major, Critical and Fatal
   - Timestamp – Date and time the event happened.
   - Description – A description of the event in plain language.

Press the up and down arrow keys to scroll through the log.

Viewing NVRAM Events

This screen displays a list of and information about 63 most important events over multiple subsystem startups.

To display NVRAM events:

1. From the Main Menu, highlight *Event Viewer* and press Enter.
2. Highlight *NVRAM Events* and press Enter.

   The log of NVRAM Events appears. Events are added to the top of the list. Each item includes:

   - Sequence number – Begins with 0 at system startup.
   - Device – Disk Array, Logical Drive, Physical Drive by its ID number.
   - Severity – (lowest to highest) Information, Warning, Minor, Major, Critical and Fatal
   - Timestamp – Date and time the event happened.
   - Description – A description of the event in plain language.
3. Press the up and down arrow keys to scroll through the log.

Checking a Reported Component

In this example, let us check disk array status.

1. Open the CLU.
2. Highlight *Disk Array Management* and press Enter.
3. Observe the status of your disk arrays.

DaId	Alias	OpStatus	CfgCapacity	FreeCapacity	MaxContiguousCap
0	DA0	OK	75.44GB	66.06GB	66.06GB
1	DA1	Degraded	189.06GB	179.68GB	179.68GB
2	DA2	OK	73.57GB	64.20GB	64.20GB

At this point, you can highlight the Degraded array and press Enter to see more information. See below.

Disk Array ID	: 1		Physical Capacity	:	189.06GB
OperationalStatus	: Degraded		MaxContiguousCapacity	:	11.18GB
FreeCapacity	: 179.68 GB		ConfigurableCapacity	:	179.68GB
SupportedRAIDLevels	: 0 5 10 1E				

Disk Array Alias	: DA1
MediaPatrol	: Enabled
PDM	: Enabled

Transport
Rebuild
Predictive Data Migration
Transition
Dedicated Spare Drives in the Array

Physical Drives in the Array
Logical Drives in the Array
[Locate Disk Array]

Save Settings [CTRL-A]
Restore Settings [CTRL-R]
Return to Previous Menu

From this screen:

- Highlight *Physical Drives in the Array* and press Enter to identify the failed disk drive
- Highlight *Rebuild* and press Enter to rebuild the array after you replace the failed disk drive

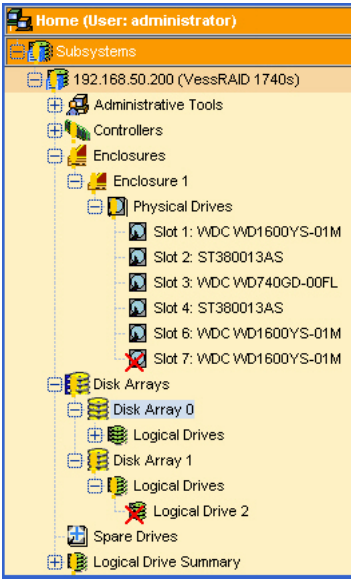
For more information, see “Critical & Offline Disk Arrays” on page 290.

WebPAM PROe Reports a Problem

WebPAM PROe aids in troubleshooting your logical drives and enclosure by continuous monitoring and reporting to the User in the following ways:

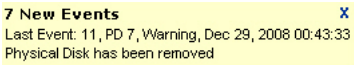
- Displays yellow !s red Xs in Tree View.

Figure 6. Yellow !s and red Xs in Tree View



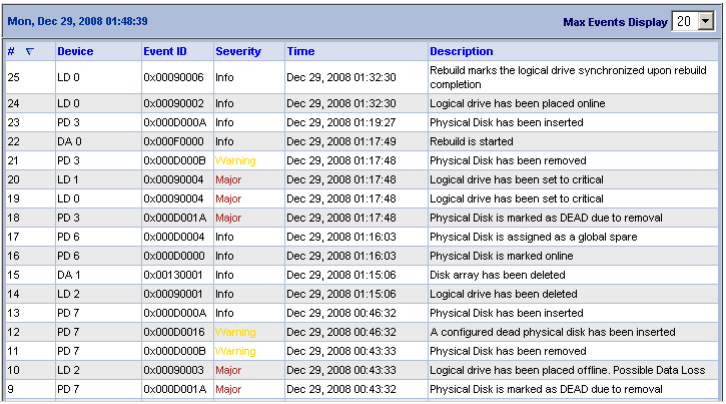
To set up email and popup message notification, see “Setting-up User Event Subscriptions” on page 61.

Figure 7. An example of a popup message



- Keeps a record in the Event Log.

Figure 8. The Event Log

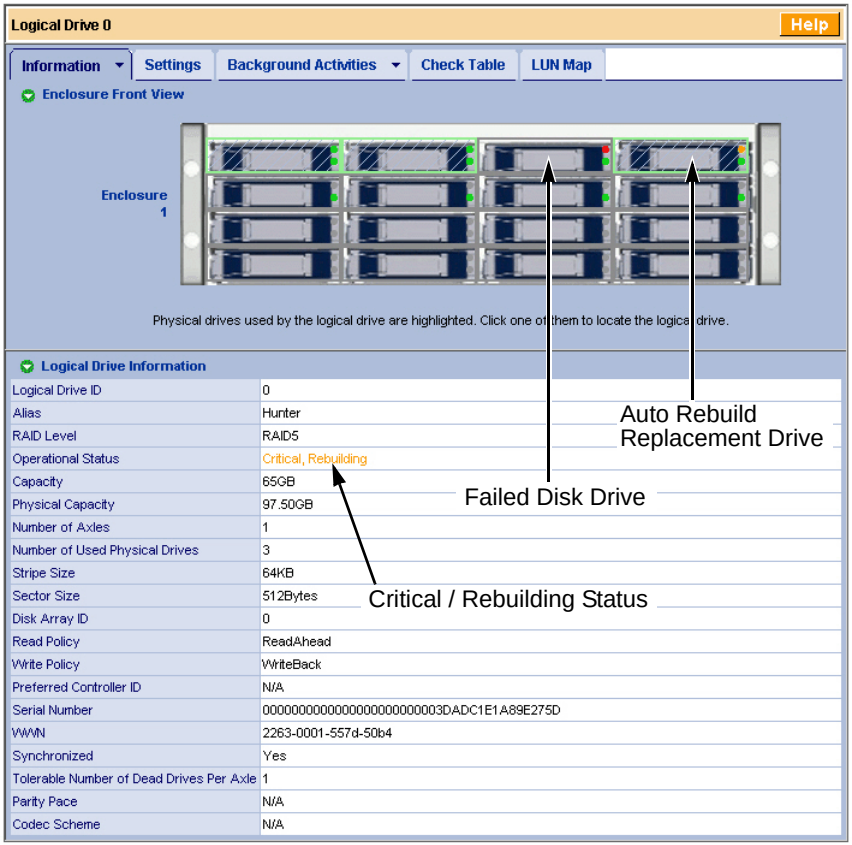


Mon, Dec 29, 2008 01:48:39 — Max Events Display: 20

#	Device	Event ID	Severity	Time	Description
25	LD 0	0x00090006	Info	Dec 29, 2008 01:32:30	Rebuild marks the logical drive synchronized upon rebuild completion
24	LD 0	0x00090002	Info	Dec 29, 2008 01:32:30	Logical drive has been placed online
23	PD 3	0x000D000A	Info	Dec 29, 2008 01:19:27	Physical Disk has been inserted
22	DA 0	0x000F0000	Info	Dec 29, 2008 01:17:49	Rebuild is started
21	PD 3	0x000D000B	Warning	Dec 29, 2008 01:17:48	Physical Disk has been removed
20	LD 1	0x00090004	Major	Dec 29, 2008 01:17:48	Logical drive has been set to critical
19	LD 0	0x00090004	Major	Dec 29, 2008 01:17:48	Logical drive has been set to critical
18	PD 3	0x000D001A	Major	Dec 29, 2008 01:17:48	Physical Disk is marked as DEAD due to removal
17	PD 6	0x000D0004	Info	Dec 29, 2008 01:16:03	Physical Disk is assigned as a global spare
16	PD 6	0x000D0000	Info	Dec 29, 2008 01:16:03	Physical Disk is marked online
15	DA 1	0x00130001	Info	Dec 29, 2008 01:15:06	Disk array has been deleted
14	LD 2	0x00090001	Info	Dec 29, 2008 01:15:06	Logical drive has been deleted
13	PD 7	0x000D000A	Info	Dec 29, 2008 00:46:32	Physical Disk has been inserted
12	PD 7	0x000D0016	Warning	Dec 29, 2008 00:46:32	A configured dead physical disk has been inserted
11	PD 7	0x000D000B	Warning	Dec 29, 2008 00:43:33	Physical Disk has been removed
10	LD 2	0x00090003	Major	Dec 29, 2008 00:43:33	Logical drive has been placed offline. Possible Data Loss
9	PD 7	0x000D001A	Major	Dec 29, 2008 00:43:32	Physical Disk is marked as DEAD due to removal

- Keeps a record in the Event Log.
- Displays full information in Management View.

Figure 9. A failed disk drive shown in Management View



Also see these troubleshooting topics:

- “Event Notification Response” on page 277
- “Critical & Offline Disk Arrays” on page 290
- “Frequently Asked Questions” on page 303

LCD Panel Reports a Problem

The LCD panel can report a certain problems, including a Critical logical drives.

Figure 10. The optional LCD panel reports a Critical logical drive

Press the ▲ or ▼ button until you see the *View Events* menu.

Then press the ↵ button to read the corresponding event. The event gives specific information, such as which physical drive failed or was removed.

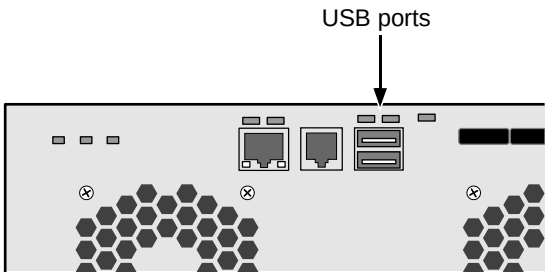
Viewing a Report from OPAS

The VessRAID subsystem comes with One Plug Auto Service (OPAS). OPAS automatically saves a comprehensive system profile and diagnostic report as a text file when you plug a USB stick in one of the USB ports on the VessRAID controller.

To view an OPAS report on the VessRAID:

1. Plug a USB stick into one of the USB ports on the VessRAID controller.

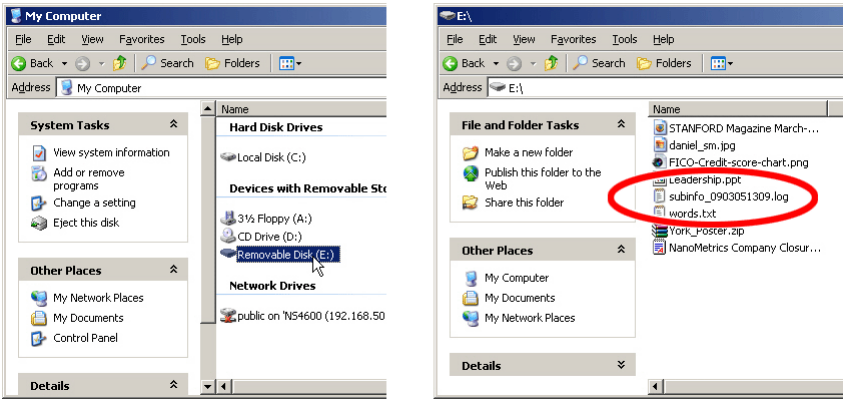
Figure 11. USB ports on the VessRAID controller



2. Wait 30 seconds, then remove the USB stick from the VessRAID.
   The controller automatically manages safe removal of the USB stick.
3. Plug the USB stick into one of the USB ports on your PC.

4. Open the root folder of the USB stick and copy the file **subinfo_xxxxxxxxxx.log** to the PC desktop or a convenient location.

Figure 12. Locating the report file on the USB stick



5. Open the **subinfo_xxxxxxxxxx.log** file in a text editor to read the system profile and diagnostic report.

Note

Choose a text editor with some word processor capability, such as WordPad on a Windows PC, for easier viewing.

Event Notification Response

When you choose Event Notification, WebPAM PROe sends popup and/or email messages regarding its status. The messages you see depend on your notification selection and what is currently happening in the VessRAID. See “Setting-up User Event Subscriptions” on page 61.

The table below cites:

- **Reported Events** – Events that require you to take action
- **Corrective Actions** – The action you should take in response to the event

A list of event categories is shown below.

- Battery (page 277)
- Blowers (page 278)
- Cache (page 279)
- Controller (page 279)
- Disk Array (page 279)
- Drive Interface Controller (page 280)
- Enclosure (page 280)
- Event Log (page 280)
- Host Interface Controller (page 280)
- Logical Drive (page 281)
- Media Patrol (page 282)
- Online Capacity Expansion (page 283)
- PDM (page 283)
- Physical Disk (page 284)
- PSU (Power Supply Units) (page 285)
- RAID Level Migration (page 286)
- Rebuild (page 286)
- Redundancy Check (page 287)
- Resource (page 288)
- Spare Check (page 288)
- Spare Drives (page 288)
- SMART (page 288)
- Synchronization (page 288)
- System (VessRAID) (page 289)
- Transition (page 289)
- Watermark (page 289)

Reported Event	Corrective Action
Battery	
Battery temperature is above the threshold	The battery is too hot. Verify proper airflow around the through the VessRAID. If airflow is OK, replace the battery. See page 228.
Battery temperature is normal	Normal.
Battery capacity is below the threshold	Battery is drained. Run battery reconditioning. See page 94 (WebPAM PROe) or page 143 (CLU).
Battery capacity is normal	Normal.

Reported Event	Corrective Action
Battery is discharging	Battery is undergoing reconditioning.
Battery is charging	Battery is being recharged.
Battery reconditioning is complete	Battery reconditioning is finished.
Battery is malfunctioning	Run battery reconditioning. Run battery reconditioning. See page 94 (WebPAM PROe) or page 143 (CLU). If this message reappears, replace the battery.
Battery reconditioned successfully	Battery reconditioning is finished.
Battery reconditioning has failed	Replace the battery. See page 228
Battery is reaching end of life	Replace the battery. See page 228.
Battery is removed	The battery was disconnected or removed. Reinstall the battery. See page 228
Battery charging failed	Replace the battery. See page 228.
Battery reconditioning started	Battery reconditioning has begun.
Battery recondition terminated	The battery was disconnected or removed during reconditioning. Reinstall the battery. See page 228.
Blowers	
Blowers have started	Normal.
Blowers have stopped	Verify that the fans are properly installed. If they still does not turn, replace the fan. See page 226.
Blower speed is increased	Check the VessRAID for overheating. See page 296.
Blower speed is decreased	Temporary overheat condition was corrected.
Blowers are NOT functioning	Replace the fans. See page 226.
Blowers have been inserted	Normal.
Blowers have been removed	Reinstall the fan. If the fan does not turn, replace it. See page 226.

Reported Event	Corrective Action
Blowers are functioning normally	Normal.
Blowers are NOT installed	Reinstall the fan. If the fan does not turn, replace it. See page 226.
Blower status is unknown	Check for airflow out of the cooling unit. If there is none, check for proper installation.
Cache	
BBU flushing has started	VessRAID's cache is being flushed.
BBU flushing has ended	VessRAID's cache has been flushed.
BBU flushing has failed	VessRAID's cache could not be flushed. Check your cache flush interval setting. See page 87 (WebPAM PROe) or page 137 (CLU).
Controller	
The controller parameter(s) changed by user	The user successfully changed controller settings. See page 87 (WebPAM PROe) or page 137 (CLU).
The controller has new crash information	Check the event logs. See page 51 and 52 (WebPAM PROe) or page 170 (CLU)
Controller temperature is above the threshold/ warning threshold	The VessRAID controller is overheating. Check for airflow around and through the controller, and verify that all fans are working. Replace fans as needed.
Controller temperature is above the critical threshold	The VessRAID controller is seriously overheating. Check for airflow around and through the controller, and verify that all fans are working. Replace fans as needed.
Disk Array	
New disk array has been created	Result of settings or user action. Normal.
Disk array has been deleted	Result of settings or user action. Normal.
Disk array has been added	Result of settings or user action. Normal.
Disk array has been removed	The physical drives of the disk array were removed from the enclosure.
Disk array settings have been changed	The user successfully disk array settings. See page 111 (WebPAM PROe) or page 153 (CLU).

Reported Event	Corrective Action
Drive Interface Controller	
Drive-interface controller found	Normal.
Drive-interface controller is NOT found	Restart the VessRAID. See page 85 (WebPAM PROe) or page 191 (CLU). If this message appears repeatedly, contact Technical Support. See page 305.
Drive-interface diagnostics has passed	Normal.
Drive-interface diagnostics has failed	Restart the VessRAID. See page 85 (WebPAM PROe) or page 191 (CLU). If this message appears repeatedly, contact Technical Support. See page 305
Drive-interface controller has generated a general/ data parity error.	Drive-to-controller parity error. If this message appears repeatedly, contact Technical Support. See page 305.
Enclosure	
Enclosure temperature is above the threshold/ warning threshold	The VessRAID is overheating. Check for airflow around and through the VessRAID, and verify that all fans are working. Replace fans as needed.
Enclosure temperature is above the critical threshold	The VessRAID is seriously overheating. Check for airflow around and through the VessRAID, and verify that all fans are working. Replace fans as needed.
Enclosure temperature is within the normal range	Normal.
Event Log	
Event logging is enabled	Event logging has been successfully enabled.
Event logging is disabled	Event logging has been disabled.
Event log buffer is cleared in RAM	The event log was cleared.
Event log buffer is cleared in NVRAM	The non-volatile RAM event log was cleared.
Event log buffer is cleared in MDD	The MDD (disk drive) event log was cleared.
Host Interface Controller	
Host-interface controller has detected bus reset	The initiator sent a reset command. If this message appears repeatedly, contact Technical Support. See page 305.

Reported Event	Corrective Action
Host-interface controller has encountered an unrecoverable error	Restart the VessRAID. See page 85 (WebPAM PROe) or page 191 (CLU).
Host-interface controller has received an abort-task/ abort task set/clear task set command.	Result of user action. Normal.
Host-interface controller has received an clear ACA command.	Result of clearing an auto contingent alliance condition. If this message appears repeatedly, contact Technical Support. See page 305.
Host-interface controller has received a LUN reset command.	Result of user action. Normal.
Host-interface controller has received a bus reboot	The VessRAID rebooted itself. If this message appears repeatedly, contact Technical Support. See page 305.
Host-interface controller has encountered an unknown error	An unidentified error occurred. If this message appears repeatedly, contact Technical Support. See page 305.
Host-interface controller has encountered a system error	A VessRAID system error occurred. If this message appears repeatedly, contact Technical Support. See page 305.
Host-interface controller has encountered a fatal error	Restart the VessRAID. See page 85 (WebPAM PROe) or page 191 (CLU). If this message appears repeatedly, contact Technical Support. See page 305.
Host-interface controller settings have changed	Result of user action. Normal.
Logical Drive	
Logical drive initialization has started	Result of user action. Normal.
Logical drive initialization has completed	Logical drive is ready to use. Normal.
Logical drive initialization has paused	Initialization paused because of user intervention, schedule or a higher priority background activity.
Logical drive initialization has resumed	Initialization has resumed again after a pause.

Reported Event	Corrective Action
Logical drive initialization has stopped	Initialization stopped because of user intervention, schedule or the logical drive was deleted or went critical or offline.
Logical drive initialization marks the logical drive offline	Initialization failure due to a failed disk drive. Replace the disk drive, delete and recreate the logical drive. See page 105 (WebPAM PROe) or page 148 (CLU).
Logical drive initialization is aborted due to an internal error.	System resources are low. Reduce system load or restart the VessRAID. See page 85 (WebPAM PROe) or page 191 (CLU).
Logical drive initialization is queued	Initialization has been set manually or by schedule.
A new logical drive has been created	Result of user action. Normal.
Logical drive has been deleted	Result of user action. Normal.
Logical drive has been placed online	The physical drives of the array are restored to online status.
Logical drive has been placed online. Possible data loss	One or more physical drives in the array went offline. See page 290.
Logical drive has been set to critical.	One or more physical drives in the array went offline. See page 290.
Logical drive axle has been placed online	RAID 50 and 60. One of the axles (RAID 5 or 6 arrays) returned on online status.
Media Patrol	
Media patrol is started	Result of settings or user action. Normal.
Media patrol is completed	Normal.
Media patrol is paused	Media patrol paused because of user intervention, schedule or a higher priority background activity.
Media patrol is resumed	Media patrol has resumed again after a pause.
Media patrol is stopped	Media patrol stopped because of user intervention, schedule or the logical drive was deleted or went critical or offline.
Media patrol is aborted due to an internal error.	System resources are low. Reduce system load or restart the VessRAID. See page 85 (WebPAM PROe) or page 191 (CLU).

Reported Event	Corrective Action
Media patrol is queued	Media patrol has been set manually or by schedule.
Media patrol is stopped internally	Media patrol stopped because the disk array was deleted or removed.
Online Capacity Expansion	
Online capacity expansion has started	Result of settings or user action. Normal.
Online capacity expansion has completed	Normal.
Online capacity expansion has paused	Expansion paused because of user intervention, schedule or higher priority background activity.
Online capacity expansion has resumed	Expansion has resumed again after a pause or a reboot.
Online capacity expansion has stopped	Expansion stopped because of user intervention, schedule or the logical drive was deleted or went critical or offline.
Online capacity expansion has encountered a physical disk error	Bad block found on a disk drive. Migration will finish. Check the disk drive check table after migration and replace disk drive as needed. See page 97 (WebPAM PROe) or page 146 (CLU).
Online capacity expansion is aborted due to an internal error.	System resources are low. Reduce system load or restart the VessRAID. See page 85 (WebPAM PROe) or page 191 (CLU).
Online capacity expansion is queued	Synchronization has been set manually or by schedule.
PDM	
PDM is started	Result of settings or user action. Normal.
PDM is completed	Normal.
PDM is paused	PDM paused because of user intervention, schedule or a higher priority background activity.
PDM is resumed	PDM has resumed again after a pause.
PDM is stopped	PDM stopped because of user intervention, schedule or the logical drive was deleted or went critical or offline.
PDM is switched to rebuild.	PDM changed to rebuild because the logical drive went critical

Reported Event	Corrective Action
PDM is stopped internally	The destination drive was removed or used for a rebuild.
Physical Disk	
Physical disk is marked online	Disk drive restored to normal operation.
Physical disk is marked online	Disk drive removed from service due to errors. If necessary, try to force the disk online. See page 100 (WebPAM PROe) or page 147 (CLU).
Physical disk is marked as dead.	Disk drive failure. Replace the disk drive.
Physical disk is marked as dead after it was removed and reinserted by the user.	Try forcing the disk online. See page 100 (WebPAM PROe) or page 147 (CLU)
Physical disk has been reset	Disk drive reset after error and should function normally.
Physical disk assigned as global spare	Result of settings or user action. Normal.
Physical disk is no longer assigned as global spare	Result of settings or user action. Normal.
Physical disk assigned as dedicated spare	Result of settings or user action. Normal.
Physical disk is no longer assigned as dedicated spare	Result of settings or user action. Normal.
Physical disk has been inserted	A disk drive has been inserted into the VessRAID subsystem.
Physical disk has been removed	A disk drive has been removed from the VessRAID subsystem.
Bad sector is found on physical disk	Disk drive has a bad sector. The drive should remap around the bad sector. If this message appears repeatedly, replace the disk drive.
Error is detected in remap sectors	Disk drive has a bad remap sectors. If this message appears repeatedly, replace the disk drive.
Command times out on physical drive	Disk drive not responding to commands. If this message appears repeatedly, replace the disk drive.

Reported Event	Corrective Action
Physical disk negotiation speed is decreased.	Disk drive had to reduce its data rate. If this message appears repeatedly, replace the disk drive.
Previously configured disk is no longer found	Disk drive may have failed or was removed from the enclosure. Replace or reinstall the disk drive as needed.
A physical disk has encountered an unknown (non-ECC) media error.	Disk drive experienced an unknown error. If this message appears repeatedly, replace the disk drive.
A physical disk has encountered PFA condition	A potentially faulty address or bad sector was found.
A configured dead physical drive has been inserted	The disk drive inserted into the VessRAID was marked as dead and will not work on the VessRAID. Replace the disk drive.
A physical drive page 0/1 settings have been changed	Result of settings or user action. Normal.
Physical disk is marked as dead due to removal/ failure of reassign sectors/PFA condition/ forced offline state	Replace the disk drive.
PSU (Power Supply Units)	
PSU is not inserted/has been removed	A power supply unit is missing from the VessRAID. Reinstall the power supply unit.
PSU is off	A power supply unit is present but turned off. Turn on he power supply.
PSU is on	Normal.
PSU is installed/ operational and turned on	Normal.
PSU is installed/ operational and turned off	A power supply unit is present but turned off. Turn on the power supply.
PSU is malfunctioning and turned on/off	Replace the power supply unit.
PSU 12V/5V/3.3V power is out of the threshold range	Replace the power supply unit.

Reported Event	Corrective Action
PSU 12V/5V/3.3V power is within the range	Normal.
RAID Level Migration	
RAID Level migration is started	Result of settings or user action. Normal.
RAID Level migration is completed	Normal.
RAID Level migration is paused	Migration paused because of user intervention, schedule or a higher priority background activity.
RAID Level migration is resumed	Migration has resumed again after a pause.
RAID Level migration is stopped	Migration stopped because of user intervention, schedule or the logical drive was deleted or went critical or offline.
RAID Level migration has encountered a physical disk error	Bad block found on a disk drive. Migration will finish. Check the disk drive check table after migration and replace disk drive as needed.
RAID Level migration is aborted due to an internal error.	System resources are low. Reduce system load or restart the VessRAID. See page 85 (WebPAM PROe) or page 191 (CLU).
RAID Level migration is queued	Migration has been set manually or by schedule.
Migration has detected/ cleared stale NV Watermark	Watermarks are progress markers left as the result of interrupted RAID migrations. If the watermark was cleared, migration should finish.
Array was incomplete due to missing NV Watermark	RAID migration was interrupted by a shutdown. If array is online, try migration again. See page 113 (WebPAM PROe) or page 155 (CLU). If array is offline, delete and recreate array. See page 110 and page 105 (WebPAM PROe) or page 152 and page 148 (CLU).
Rebuild	
Rebuild is started	Result of settings or user action. Normal.
Rebuild is completed	Normal.
Rebuild is paused	Rebuild paused because of user intervention, schedule or a higher priority background activity.

Reported Event	Corrective Action
Rebuild is resumed	Rebuild has resumed again after a pause.
Rebuild is stopped	Rebuild stopped because of user intervention, schedule or the logical drive was deleted or the target disk drive encountered an error. If rebuild stopped by the user, restart the rebuild. See page 114 (WebPAM PROe) or page 154 (CLU).
Rebuild stopped internally	The logical drive is offline. See page 290.
Rebuild is aborted due to an internal error.	System resources are low. Reduce system load or restart the VessRAID. See page 85 (WebPAM PROe) or page 191 (CLU).
Rebuild is queued	Rebuild has been set manually or by schedule.
Rebuild marks logical drive synchronized upon rebuild completion	Result of successful rebuild. Normal.
Redundancy Check	
Redundancy Check is started	Redundancy Check has started manually or by schedule.
Redundancy Check is completed	Redundancy Check has finished.
Redundancy Check is paused	Redundancy Check paused because of user intervention, schedule or a higher priority background activity.
Redundancy Check is resumed	Redundancy Check has resumed again after a pause.
Redundancy Check is stopped	Redundancy Check stopped because of user intervention, schedule or the logical drive was deleted or went critical or offline. See page 290.
Redundancy Check is aborted due to internal error	System resources are low. Reduce system load or restart the VessRAID. See page 85 (WebPAM PROe) or page 191 (CLU).
Redundancy Check encountered inconsistent block(s)	Check the logical drive's inconsistent block table. See page 122. Rebuild the disk array if necessary. See page 105 (WebPAM PROe) or page 148 (CLU).
Redundancy Check task is queued	Redundancy Check has been set manually or by schedule.
Redundancy Check task is stopped internally	The logical drive is offline. See page 290.

Reported Event	Corrective Action
Resource	
Resource is NOT available	System resources are low. Reduce system load or restart the VessRAID. See page 85 (WebPAM PROe) or page 191 (CLU).
Spare Check	
Spare check started on the given spare drive	Result of settings or user action. Normal.
Spare check completed successfully on the given spare drive	Normal.
Spare Drives	
Physical disk assigned as global spare	Result of settings or user action. Normal.
Physical disk is no longer assigned as global spare	Result of settings or user action. Normal.
Global Spare has been deleted	Result of settings or user action. Normal.
Physical disk assigned as dedicated spare	Result of settings or user action. Normal.
Physical disk is no longer assigned as dedicated spare	Result of settings or user action. Normal.
Dedicated Spare has been deleted	Result of settings or user action. Normal.
SMART	
SMART error is received	A disk drive reported a SMART error. If this message appears repeatedly, replace the disk drive.
Synchronization	
Synchronization is started	Result of settings or user action. Normal.
Synchronization is completed	Normal.
Synchronization is paused	Synchronization paused because of user intervention, schedule or higher priority background activity.
Synchronization is resumed	Synchronization has resumed again after a pause or a reboot.

Reported Event	Corrective Action
Synchronization is stopped	Synchronization stopped because of user intervention, schedule or the logical drive was deleted or went critical or offline.
Synchronization is aborted due to an internal error.	System resources are low. Reduce system load or restart the VessRAID. See page 85 (WebPAM PROe) or page 191 (CLU).
Synchronization is queued	Synchronization is already running on another logical drive in the same array.
Synchronization is stopped internally	Synchronization stopped because the disk array was deleted or removed.
System (VessRAID)	
The system is started	The VessRAID has been started.
The system is stopped	The VessRAID was shut down.
Transition	
Transition is started	Result of settings or user action. Normal.
Transition is completed	Normal.
Transition is paused	Transition paused because of user intervention, schedule or a higher priority background activity.
Transition is resumed	Transition has resumed again after a pause.
Transition is stopped	Transition stopped because of user intervention or the logical drive was deleted.
Transition was switched to rebuild	Transition changed to rebuild because the logical drive went critical.
Watermark	
Migration has detected/ cleared stale NV Watermark	Watermarks are progress markers left as the result of interrupted RAID migrations. If the watermark was cleared, migration should finish.
Array was incomplete due to missing NV Watermark	RAID migration was interrupted by a shutdown. If array is online, try migration again. See page 113 (WebPAM PROe) or page 155 (CLU). If array is offline, delete and recreate array. See page 110 and page 105 (WebPAM PROe) or page 152 and page 148 (CLU).

Critical & Offline Disk Arrays

A fault-tolerant disk array—RAID 1, 1E, 5, 10, and 50—goes *critical* when a disk drive is removed or fails. A RAID 6 or 60 disk array—goes *degraded* when a disk drive is removed or fails and *critical* when two disk drives are removed of fail.

Due to the fault tolerance of the disk array, the data is still available and online. However, once the disk array goes critical, the disk array has lost its fault tolerance, and performance may be adversely affected.

If the fault was caused by a failed drive that was removed, the drive must be replaced by another drive, either identical or larger, in order for the RAID system to rebuild and restore optimal configuration.

If your fault-tolerant disk array—RAID 1, 1E, 5, 6, 10, 50, and 60— goes *offline*, contact Promise Technical Support. See page 305.

Warning

Take no further corrective action until you have consulted with Promise Technical Support.

A non-fault tolerant disk array—RAID 0—goes *offline* when a disk drive is removed or fails. Since the disk array is not fault tolerant, the data stored in the disk array is no longer accessible.

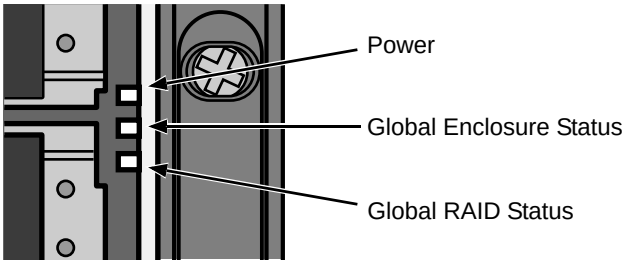
If one disk drive fails, all of the data on the disk array is lost. You must replace the failed drive. Then, if the disk array had more than one disk drive, delete the disk array and re-create it. Restore the data from a backup source.

When a Physical Drive Fails

VessRAID provides both audible and visual indicators to alert you of a disk drive failure. The following will occur when a disk drive fails or goes offline:

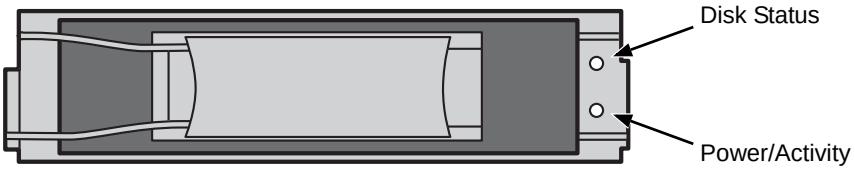
- The Global RAID Status LED changes from green to amber.

Figure 13. VessRAID front panel LEDs



- The Disk Status LED changes from green to red.

Figure 14. VessRAID disk drive carrier LEDs



- The audible alarm repeatedly sounds two short beeps. See page 265.
- WebPAM PROe reports the condition. See page 272.

Also see “Physical Drive Problems” on page 294.

With a Hot Spare Drive

When a physical drive in a disk array fails and a spare drive of adequate capacity is available, the disk array will begin to rebuild automatically using the spare drive.

After the disk array rebuilds itself using the spare drive, you must replace the failed drive.

To set up a spare drive, see “Creating a Spare Drive” on page 125 (WebPAM PROe) or page 159 (CLU).

Without a Hot Spare Drive

If there is no hot spare drive of adequate capacity, you must remove the failed drive and install an unconfigured replacement drive of the same or greater capacity in the same slot as the failed drive. Until you install the replacement drive, the logical drive will remain Degraded.

Caution

VessRAID supports disk drive hot-swapping. To avoid hand contact with an electrical hazard, do not remove more than one drive carrier a time.

- If the Auto Rebuild function is ENABLED, the disk array will begin to rebuild automatically as soon as you replace the failed drive.
- If the Auto Rebuild function is DISABLED, you must manually rebuild the disk array after you replace the failed drive.

To enable Automatic Rebuild, see “Making Background Activity Settings” on page 54 (WebPAM PROe) or page 168 (CLU).

To set Hot Spare Policy, see “Making Spare Drive Settings” on page 126 (WebPAM PROe) or page 160 (CLU).

Important

If your replacement disk drive was formerly part of a different disk array or logical drive, you must clear the configuration data on the replacement drive before you use it.
See page 99 (WebPAM PROe) or page 146 (CLU).

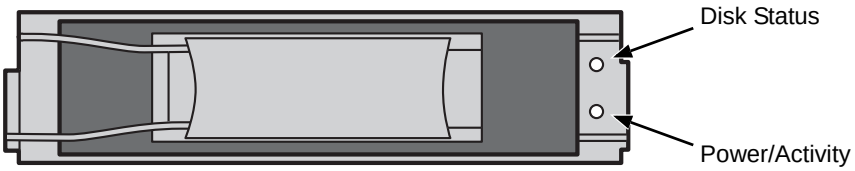
Rebuild Operation

During rebuild:

- The alarm sounds a single short beep, repeated
- No warning icon displays over the Disk Array or Logical Drive in the Tree.

  Management View reports the Disk Array’s Operational Status as OK, Rebuilding.
- The drive carrier holding the rebuilding physical drive displays a green Activity (lower) LED while the Status (upper) LED flashes green once per second.

Figure 15. VessRAID disk drive carrier LEDs



During rebuilding, you can still read and write data to the logical drive. However, fault tolerance is lost until the Disk Array returns to OK (not-rebuilding) status.

After a successful rebuild:

- The alarm is silent
- The Disk Array’s Operational Status as OK
- The rebuilt disk drive Status LED displays steady green

Incomplete Array

An incomplete array can result from any of the following conditions:

- The NVRAM watermark for the RAID level migration currently in progress is missing or cannot be found
- A physical drive goes missing during transport

See “Physical Drive Failed” on page 294 for more information.

When VessRAID discovers an incomplete array, WebPAM PROe displays a dialog box asking you to:

- Click the **OK** button to accept the incomplete array
- Click the **Cancel** button to reject the incomplete array

Before you accept the incomplete array, be sure all of the physical drives are present and that their drive carriers are properly installed into the enclosure. See “Installing Disk Drives” on page 15.

If you choose to accept the incomplete array:

1. Click **OK** in the incomplete array dialog box.
2. Check the operational status of the logical drives in the array.
    - If the logical drives are *critical* or *degraded*, proceed with a rebuild. See “Rebuilding a Disk Array” on page 114 (WebPAM PROe) or page 154 (CLU).
    - If the logical drives are *offline*, contact Technical Support. See page 305.
3. Restore your data from a backup source, if required.

The CLU displays the option *Accept Incomplete Array* on the Disk Array Info and Settings screen. Highlight the option and press Enter to accept the incomplete array.

If you choose NOT to accept the incomplete array:

1. Click **Cancel** in the incomplete array dialog box.
2. Do one of the following:
    - Delete the array. See “Deleting a Disk Array” on page 110 (WebPAM PROe) or page 152 (CLU).
    - Replace the missing physical drive.

Physical Drive Problems

Physical Drive Offline

Check the drive for:

- **PFA Condition** – Caused by a bad block or sector.
  See “Clearing Stale and PFA Conditions” on page 99 (WebPAM PROe) or page 146 (CLU).
- **Stale Configuration** – Caused by obsolete array information on the physical drive. Identify the disk array to which the physical drive belongs. Then delete the disk array. See “Deleting a Disk Array” on page 110 (WebPAM PROe) or page 152 (CLU).

  If the error condition remains on the physical drive, clear the error condition. See “Clearing Stale and PFA Conditions” on page 99 (WebPAM PROe) or page 146 (CLU).

Physical Drive Not Usable

This condition occurs when you have a missing or defective SAS cable between the VessRAID subsystem and a VessJBOD enclosure.

Physical Drive Failed

When physical drive status shows *failed*, the physical drive cannot be repaired. You must replace the failed drive.

Caution

VessRAID supports disk drive hot-swapping. To avoid hand contact with an electrical hazard, do not remove more than one drive carrier a time.

Physical Drive Fails during Migration

VessRAID has two methods for migrating a disk array:

- **DDF** – The default setting. Slower but reliable
- **NVRAM** – An optional setting that requires special access. Faster but risks data loss

Normally, RAID level migration is done under the default Disk Data Format (DDF) setting. If a physical drive or the controller fails during migration, the disk array goes critical, and you can rebuild it. Migration under DDF can take up to several hours depending on the number and size of the physical drives and data input/output activity.

You can set the VessRAID to migrate disk arrays under Non-Volatile Random Access Memory (NVRAM), a much faster process because it writes data to the memory in the controller. However, if a physical drive or the controller fails during migration, the logical drives will go offline and you will lose data. See “Incomplete Array” on page 293.

Because the setting for migration under NVRAM requires special access, most users will not encounter this condition.

Physical Drive Fails during Transport

Transport is the action of moving the physical drives of a disk array:

- To different slots in the same VessRAID enclosure
- From one VessRAID enclosure to another

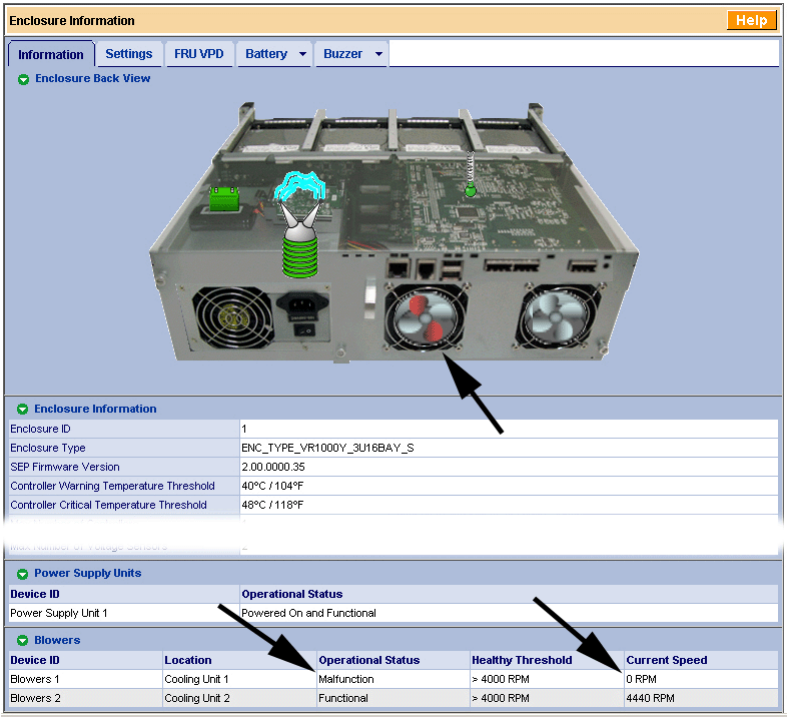
If a physical drive fails during a transport, or you do not move all of the physical drives to their new locations, WebPAM PROe will display an incomplete array. See “Incomplete Array” on page 293.

Enclosure Problems

WebPAM PROe displays yellow !s red Xs in Tree View to identify components that need attention.

When a yellow ! appears over a Subsystem in Tree View, click the Enclosure icon. The Enclosure screen will display (below).

Figure 16. Enclosure information in Management View



In this example, one of the RAID Controller fans has failed. The Enclosure Diagram displays color and motion changes to identify the failed fan. In WebPAM PROe, RAID Controller fans are called *Blowers*.

See “Replacing a Cooling Fan” on page 226 for instructions.

Note that the image above was shortened to fit on the page.

Enclosure

Overheat

Overheating is a potentially serious condition because the excessively high temperatures can lead to disk drive failure and controller malfunction.

Overheating usually results from:

- Fan failure
- Poor air circulation around the enclosure

Fan Failure

On VessRAID, there are two kinds of fans:

- Power supply fan
- RAID Controller fan

If a power supply fan fails, you must replace the power supply.

If a RAID Controller fan fails, you can replace it onsite. See page 226.

Air Circulation

Air circulation around the VessRAID enclosure may be a more complex problem. Use the thermometer icons to help you locate the specific hot spot. Check for these conditions:

- Accumulated dust or objects blocking the fans
- Less than a minimum of 5 inches (13 cm) space between the back of the VessRAID and the wall or other object
- Ambient temperature above 95°F (35°C) where the VessRAID is operating

Cooling Down the Enclosure

To cool down a VessRAID enclosure:

- Correct any problems identified above
- Power down the VessRAID and let it sit for an hour or longer

Power Supply

OK

Replace Soon

Replace Now

VessRAID 1800s Series

VessRAID 1800s Series has two power supplies. The advantage of two power supplies is that, should one fail, the other will continue powering the subsystem. The power supplies are hot-swappable.

VessRAID 1700s Series

VessRAID 1700s Series has only one power supply and it is not replaceable onsite. If you need to replace the power supply, contact Technical Support and make arrangements to return the subsystem to Promise for service. See page 305.

Fan Failure

As noted above, if a power supply fan fails, you must replace the power supply. Without the fan to cool it, the power supply will overheat and eventually fail anyway.

See page 224 for instructions on replacing a power supply.

Battery

VessRAID uses a battery as backup power for the cache. Should a power failure occur, the battery enables the cache to hold data up to 72 hours. The battery recharges during normal VessRAID operation.

First, try reconditioning the battery. See page 94 or page 143.

If the battery does not respond, installing a replacement battery will correct a marginal or failed condition.

See page 228 for instructions on replacing the battery.

Connection Problems

When you install your Promise product following the instructions in the *Quick Start Guide* and this *Product Manual*, you should have little trouble getting your equipment to work the first time. But connection problems can arise that are not the User's or Installer's fault. Every conceivable problem cannot be covered in the documentation but some guidelines could be helpful.

Connection problems cause a majority of failures in almost any electrical system. While the installation of the cables and components was correct, they don't function properly, or at all, because:

- A connector is dirty or corroded.
- A connector is loose or damaged.
- A cable looks OK outside but has an open circuit inside.
- The wrong cable was used.

VessRAIDs ship with a full set of new cables, as required for each specific model. Be sure to use these components because:

- They are the proper ones for your RAID subsystem.
- They are in brand-new condition.
- You paid for them with the purchase of your VessRAID.

Serial Connections

VessRAID uses a serial connection for the command line interface (CLI) and the command line utility (CLU). After you set the IP address, you can access the CLI and CLU through a network connection, also. Normally, users prefer WebPAM PROe because of its graphic user interface. But the CLI and CLU can do the same jobs. And they will work when your network connection is down.

For VessRAID, you must use the CLI or CLU to set the Management Port IP address in order for WebPAM PROe to connect with it. See “Setting Up Serial Cable Connections” on page 20 and “Setting up the Serial Connection” on page 25.

The CLI and CLU control and manage but they do not move data. They communicate through a RJ11-to-DB9 cable, supplied with the VessRAID. An ordinary serial cable will not work for this purpose. You may choose not use the CLI or CLU often and want to disconnect and store the cable. Consider leaving it connected, to be sure it will be there when you need it.

Network Connections

Each controller has an Ethernet (RJ45) Management Port connector on the back of the enclosure. This is a Gigabit Ethernet connector designed to connect to your network. The VessRAID becomes a node on your network like any other PC, server or other component with an IP address.

VessRAID ships from the factory a default Management Port IP address of 192.168.0.1. You must change this address to one that will work with your network. See “Chapter 3: VessRAID Setup” on page 25.

Figure 17. Management port connection on the RAID controller

LEDs	State		
	Dark	**Green**	**Flashing Green**
Activity	No activity	—	Activity
Connectivity	10BaseT	100BaseT	—

Note that VessRAID Management Port can accept IP address assignments from a DHCP server. Use VessRAID’s Command Line Utility (CLU) to enable this feature. If you have not activated DHCP support but there is a DHCP server on your network, there is a chance that it will inadvertently assign the VessRAID’s Management Port IP address to another node. You might see a warning to this effect on your Host PC’s monitor. If this happens, WebPAM PROe might not connect. See your network administrator to work out a suitable arrangement.

Browser Does Not Connect to WebPAM PROe

If you successfully setup and connected to WebPAM PROe, then suddenly you can no longer connect, it might be the result of the following three conditions:

- DHCP is enabled on your VessRAID's management port
- The DHCP server does not have a dedicated IP address for the VessRAID
- The VessRAID restarted and your DHCP server assigned a new IP address

You must obtain the new IP Address for the management port in order to direct your browser to the VessRAID and start WebPAM PROe.

If your VessRAID has a LCD panel, it displays the VessRAID model number and management port IP address, as shown in Figure 18.

Figure 18. LCD panel default display

If your VessRAID does not have an LCD panel, set up a serial connection to access the CLI. See page 20 and 25 for more information.

To find the new IP address:

1. Start your PC's terminal VT100 or ANSI emulation program.
2. Press Enter once to launch the CLI.
3. At the Login prompt, type **administrator** and press Enter.
4. At the Password prompt, type **password** and press Enter.
5. Type **net** and press Enter.

   administrator@cli> **net**

   ```
   ==========================================
   CId   Port  Type  IP              Mask            Gateway        Link
   ==========================================
   1     1     Mgmt  192.168.10.85   255.255.255.0   192.168.10.1   Up
   ```

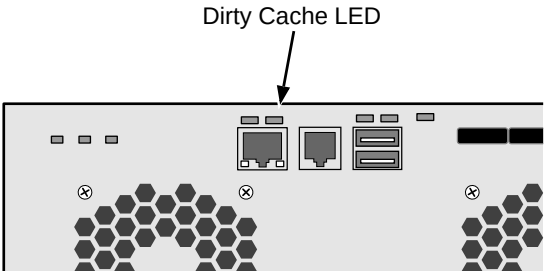
   The new management port IP address and other network settings are displayed on the screen.

   Enter the new IP address into your browser to log into WebPAM PROe.

Unsaved Data in the Controller Cache

The Dirty Cache LED informs you that there is data in the cache that has not been saved to non-volatile memory. Such data is sometimes called “dirty,” not to suggest it is corrupted in some way but because it has not been saved to a disk drive.

Figure 19. Dirty Cache LED



If there is unsaved data in the controller’s cache, the Dirty Cache LED shines amber. During this time, do NOT power down the VessRAID. Wait until the LED will goes dark.

Chapter 10: Support

- Frequently Asked Questions (below)
- Contacting Technical Support (page 305)
- Limited Warranty (page 309)
- Returning the Product For Repair (page 311)

Frequently Asked Questions

What kind of disk drives can I use with VessRAID?

VessRAID supports 3.0 GB/s Serial ATA disk drives and 3.0 Gb/s SAS drives.

VessRAID does not support Parallel ATA (PATA) disk drives.

Can I take the disk drives from my Promise VTrak, put them into the VessRAID, and keep my disk array or logical drive intact?

Yes. Like VessRAID, the newer VTrak subsystems use the industry-standard DDF method of disk metadata, stored in the reserve sector of each physical drive. Use the Transport function to prepare your disk drives before moving them. See “Preparing the Disk Array for Transport” on page 154 or page 117.

Early VTrak subsystems used a proprietary method of disk metadata. VessRAID subsystems have a metadata-to-DDF conversion feature. To use the conversion feature, you must restart the VessRAID after installing disk drives from an older VTrak subsystem.

Note that if you move your disk drives from the VessRAID to an early VTrak, the older subsystem will not recognize your disk array or logical drive.

How can I tell when the VessRAID has fully booted?

When the VessRAID is fully booted up, the Power and FRU LEDs will light up green. If a disk array is present, the Logical Drive LED will light up green also. The system heartbeat LED blinks green seven times in three seconds, goes dark for six seconds, then repeats the pattern.

Why does VessRAID come with a Command Line Utility?

First, to assign your VessRAID an IP address in order for the WebPAM PROe management software to connect to it. Second, in the event of a network failure, you can still access the VessRAID. Third, some users prefer the Command Line Utility.

WebPAM PROe connection was working OK. But later on, it timed out. What do I do now?

The network condition can time-out for several reasons. When an open connection has no action for a specific amount of time (the Administrator can change it), the connection times-out automatically for security reasons. When you attempt to use WebPAM, it returns to the login screen. Enter your user name and password and click Login, and WebPAM will establish a new connection. See “Making Web Server Settings” on page 92.

I can access the VessRAID over my company’s intranet. But I can’t access it from an outside Internet connection. How do I make the Internet connection work?

This condition is not related to VessRAID, but is due to your firewall and network connection protocol. Contact your MIS Administrator.

With some Promise RAID subsystems, I used the Server’s IP address in WebPAM PRO to connect with the RAID subsystem. Why is this VessRAID different?

VessRAID has the server software embedded. With VessRAID, you point your browser directly to the VessRAID rather than a server. Also, with VessRAID, you do not have to create a subsystem because the subsystem already exists.

Why can a RAID 1 logical drive on VessRAID consist of only two disk drives?

On VessRAID, RAID 1 logical drives work in mirrored physical drive pairs. You could create up to eight RAID 1 logical drives. Or you can create a single RAID 10 logical drive with data mirroring and up to 16 physical drives. If you have an odd number of drives but still want data mirroring, use RAID 1E.

See “Installing Disk Drives” on page 17 and “Introduction to RAID” on page 237 for more information on the number of physical drives you can use for each RAID level.

Are logical drives on VessRAID limited to 2 TB?

No. But verify that your operating system *supports* logical drives over 2 TB. Also, for the operating system to *recognize* the full capacity of logical drives over 2 TB, you must specify a sector size of 1 KB or larger when you create the logical drive. See “Choosing Sector Size” on page 253 or more information.

Do I have to install WebPAM PROe on my network server?

No. Use the WebPAM PROe embedded with the VessRAID.

How can I be sure everything is working OK on the VessRAID?

Locally: The VessRAID enclosure has LEDs on the front to monitor the status of power, field replaceable units (FRUs) and logical drives. When these are green, VessRAID is functioning normally.

Remotely: Check the Tree Icons in WebPAM. If there are no yellow or red warning icons displayed, VessRAID is functioning normally.

What happens if a logical drive goes critical?

On the front of VessRAID, the logical drive LED turns amber and an audible alarm sounds. See “Critical & Offline Disk Arrays” on page 301.

Can a VessRAID dual-power-supply models run on just one power supply?

Yes, it is possible to run the VessRAID dual-power-supply models on a single power supply. There are two power supplies so that these systems will continue running if one of the power supply fails. But deliberately leaving one power supply off negates this advantage.

In addition, leaving one power supply off reduces air flow through the VessRAID enclosure and can contribute to overheating. Always switch on both power supplies.

VessRAID’s Netsend service does not report all events to Windows PCs.

This condition results from a shortcoming in Windows Messenger that causes miscommunication with Netsend. Promise is developing a workaround at the time of this writing. Note that all events are correctly reported in the Event Viewer.

Contacting Technical Support

Promise Technical Support provides several support options for Promise users to access information and updates. We encourage you to use one of our electronic services, which provide product information updates for the most efficient service and support.

If you decide to contact us, please have the following information available:

- Product model and serial number
- BIOS, firmware, and driver version numbers
- A description of the problem / situation
- System configuration information, including: motherboard and CPU type, hard drive model(s), SAS/SATA/ATA/ATAPI drives & devices, and other controllers.

Technical Support Services

Promise Online™ Web Site	http://www.promise.com/support/support_eng.asp (technical documents, drivers, utilities, etc.)

United States

E-mail Support	e-Support On-Line
Fax Support	+1 408 228 1100 Attn: Technical Support
Phone Support	+1 408 228 1400 option 4
If you wish to write us for support:	Promise Technology, Inc. 580 Cottonwood Drive Milpitas, CA 95035, USA

The Netherlands

E-mail Support	e-Support On-Line
Fax Support	+31 0 40 256 9463 Attn: Technical Support
Phone Support	+31 0 40 235 2600
If you wish to write us for support:	Promise Technology Europe B.V. Science Park Eindhoven 5542 5692 EL Son, The Netherlands

Germany

E-mail Support	e-Support On-Line
Fax Technical Support	+49 0 2 31 56 76 48 29 Attn: Technical Support
Phone Technical Support	+49 0 2 31 56 76 48 10
If you wish to write us for support:	Promise Technology Germany Europaplatz 9 44269 Dortmund, Germany

Italy

E-mail Support	e-Support On-Line
Fax Support	+39 0 6 367 124 00 Attn: Technical Support
Phone Support	+39 0 6 367 126 26
If you wish to write us for support:	Promise Technology Italy Piazza del Popolo 18 00187 Roma, Italia

Taiwan

E-mail Support	e-Support On-Line
Fax Support	+886 3 578 2390 Attn: Technical Support
Phone Support	+886 3 578 2395 ext. 8825 or 8826
If you wish to write us for support:	Promise Technology, Inc. 2F, No. 30, Industry E. Rd. IX Science-based Industrial Park Hsin-Chu 30075, Taiwan (R.O.C.)

China

E-mail Support	e-Support On-Line
Fax Support	+86 10 8857 8015 Attn: Technical Support
Phone Support	+86 10 8857 8085 or 8095
If you wish to write us for support:	Promise Technology China – Beijing Room 1205, Tower C Webok Time Center, No.17 South Zhong Guan Cun Street Hai Dian District, Beijing 100081, China
E-mail Support	e-Support On-Line
Fax Support	+86 21 6249 4627 Attn: Technical Support
Phone Support	+86 21 6249 4192, 4193, or 4199
If you wish to write us for support:	Promise Technology China – Shanghai Room 508, Leader Tower 1189 West Wu Ding Road Jing An District, Shanghai 200042, China

Limited Warranty

Promise Technology, Inc. (“Promise”) warrants that this product, from the time of the delivery of the product to the original end user:

a) all components, except the cache backup battery, for a period of three (3) years;

b) the cache backup battery, for a period of one (1) year;

c) will conform to Promise’s specifications;

d) will be free from defects in material and workmanship under normal use and service.

This warranty:

a) applies only to products which are new and in cartons on the date of purchase;

b) is not transferable;

c) is valid only when accompanied by a copy of the original purchase invoice.

d) Is not valid on spare parts.

This warranty shall not apply to defects resulting from:

a) improper or inadequate maintenance, or unauthorized modification(s), performed by the end user;

b) operation outside the environmental specifications for the product;

c) accident, misuse, negligence, misapplication, abuse, natural or personal disaster, or maintenance by anyone other than a Promise or a Promise-authorized service center.

Disclaimer of other warranties

This warranty covers only parts and labor, and excludes coverage on software items as expressly set above.

Except as expressly set forth above, Promise DISCLAIMS any warranties, expressed or implied, by statute or otherwise, regarding the product, including, without limitation, any warranties for fitness for any purpose, quality, merchantability, non-infringement, or otherwise. Promise makes no warranty or representation concerning the suitability of any product for use with any other item. You assume full responsibility for selecting products and for ensuring that the products selected are compatible and appropriate for use with other goods with which they will be used.

Promise DOES NOT WARRANT that any product is free from errors or that it will interface without problems with your computer system. It is your responsibility to back up or otherwise save important data before installing any product and continue to back up your important data regularly.

No other document, statement or representation may be relied on to vary the terms of this limited warranty.

Promise's sole responsibility with respect to any product is to do one of the following:

a) replace the product with a conforming unit of the same or superior product;

b) repair the product.

Promise shall not be liable for the cost of procuring substitute goods, services, lost profits, unrealized savings, equipment damage, costs of recovering, reprogramming, or reproducing of programs or data stored in or used with the products, or for any other general, special, consequential, indirect, incidental, or punitive damages, whether in contract, tort, or otherwise, notwithstanding the failure of the essential purpose of the foregoing remedy and regardless of whether Promise has been advised of the possibility of such damages. Promise is not an insurer. If you desire insurance against such damage, you must obtain insurance from another party.

Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, so the above limitation may not apply to you.

This warranty gives specific legal rights, and you may also have other rights that vary from state to state. This limited warranty is governed by the State of California.

Your Responsibilities

You are responsible for determining whether the product is appropriate for your use and will interface with your equipment without malfunction or damage. You are also responsible for backing up your data before installing any product and for regularly backing up your data after installing the product. Promise is not liable for any damage to equipment or data loss resulting from the use of any product.

Returning the Product For Repair

If you suspect a product is not working properly, or if you have any questions about your product, contact our Technical Support Staff through one of our Technical Services, making sure to provide the following information:

- Product model and serial number (required)
- Return shipping address
- Daytime phone number
- Description of the problem
- Copy of the original purchase invoice

The technician will assist you in determining whether the product requires repair. If the product needs repair, the Technical Support Department will issue an RMA (Return Merchandise Authorization) number.

Important

Obtain an RMA number from Technical Support *before* you return the product and write the RMA number on the label. The RMA number is essential for tracking your product and providing the proper service.

Return ONLY the specific product covered by the warranty (do not ship cables, manuals, diskettes, etc.), with a copy of your proof of purchase to:

USA and Canada:	Promise Technology, Inc. Customer Service Dept. Attn.: RMA # _____ 47654 Kato Road Fremont, CA 94538
Other Countries:	Return the product to your dealer or retailer. Contact them for instructions before shipping the product.

You must follow the packaging guidelines for returning products:

- Use the original shipping carton and packaging
- Include a summary of the product's problem(s)
- Write an attention line on the box with the RMA number
- Include a copy of proof of purchase

You are responsible for the cost of insurance and shipment of the product to Promise. Note that damage incurred due to improper transport or packaging is not covered under the Limited Warranty.

When repairing returned product(s), Promise may replace defective parts with new or reconditioned parts, or replace the entire unit with a new or reconditioned unit. In the event of a replacement, the replacement unit will be under warranty for the remainder of the original warranty term from purchase date, or 30 days, whichever is longer.

Promise will pay for standard return shipping charges only. You will be required to pay for any additional shipping options (such as express shipping).

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